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FIRST PART,
ORIGINAL ARTICLES

The Various Methods of Farming in Spain

by

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This paper (within the limits allowed by a periodical publication) comprise the following points: grouping of the various Spanish provinces into large regions, and of the arable lands and "aprovechamientos" (meadows, pastures and woods) into large groups in each of the provinces; prevailing form of land tenure; means of production used in medium and small farms.

The following illustration will forcedly give only the average general characters of each region, and in each of these the method of farming presents numerous special cases corresponding to certain local conditions, the mention of which would be too lengthy to be mentioned here.

The division into agricultural regions, as well as the extent of arable and of meadows, pastures and woods, corresponds to the official division established by the Ministerio del Fomento for the agricultural requirements of the country and to the statistics recently published by the General Direction of Agriculture.

The provinces included in each region are indicated, so that with the aid of a map an idea may be formed of the distribution of the various kinds of farming.

1st Region: Central or New Castile. — It comprises the provinces of Madrid, Toledo, Guadalajara and Cuenca. The distribution of productive lands is as follows:

Cereals	4 939 820 acres
Fruit trees, olives, vines and market gardens	1 131 109 "
Forests and pastures	5 559 481 "

It is thus seen that the extent of the arable lands is very nearly equal to that of forests and pastures. On this point there are very much scattered subdivisions.

Great and medium estates generally prevail. There are many properties called "dehesas"; some are wooded (pines, oaks, etc.); others are not, and their utilization consists in the renting of pastures within limits set by the protection of the woods.

The large farms, as well as the olive groves and vineyards, are farmed by the owners themselves and are not rented. Small parcels of land at a distance from centres of population and the market gardens in some localities are rented; the lease lasts two to six years and the rent is generally paid in kind.

In this region the type of medium farms is met with also. The mode of production corresponding to this degree of cultural intensity, expressed in percentages of the working capital as stated in a remarkable work by Leopoldo Hernandez, civil engineer and manager of the Corunna R. are the following:

	Percentage of working capital
Furniture of owner and staff	4.70
Material and implements	17.79
Draught animals	44.88
Provisions	22.66
Circulating capital	9.97
Total	100.00

2nd Region: Mancha and Estremadura.—It comprises the province of Ciudad Real, Albacete, Caceres and Badajoz, the two first forming la Mancha and the two latter Estremadura. The distribution of acreage is as follows:

Cereals	5 138 889	acres
Fruit trees, vines, olives and market gardens	1 503 835	"
Forests and pastures,	10 932 220	"

Wine and oil represent the most important crops in la Mancha, where vineyards occupy upwards of 250 000 acres in the province of Ciudad Real and of 150 000 in that of Albacete, while olive groves cover respectively 50 000 and 15 000 acres. Besides, the association of these two crops is equally important. Vineyards and olive groves extend also in to the Estremadura provinces.

In this region, as in the preceding one, the farms are usually managed by the owners themselves or their agents. Leasing is not much practised while farming on the share system is more frequent.

In the dry lands under annual crops the owner must provide:

a) 75 per cent. of the seed; b) 50 per cent. of the cost of hoeing; c) the cost of the manure used.

The metayer must contribute: a) 25 per cent. of the land tax; b) the preliminary ploughings; c) the cost of sowing and half the cost of hoeing.

expenses for harvesting, gathering in the crops, threshing, cleaning and ing. One half of the crop belongs to the owner, the other half and the w to the metayer.

Olive groves are not rented; they are managed by the owner himself is agent, or worked on the share system. In this case the owner contri- s : a) 80 per cent. of the land tax, b) 50 per cent. of the expenses for ing; the metayer's share is : a) 20 per cent. of the land-tax, b) three ghings, c) the cost of pruning, if he takes all the wood, and the expense icking and carting, d) 50 per cent. of the cost of guarding the e, e) the cost of extracting the oil. The crop of olives is divided into d parts between the owner and the metayer.

The vineyards are, like the olive groves, either managed by the owner self or his agent, or worked on the share system, but never leased.

In Estremadura the lands called "dehesas" and covered with oaks utilized by sending pigs on them to feed on the acorns.

Towards the middle of autumn when the pastures begin to be poor and acorns on the evergreen oaks, which are earlier than those on the cork , begin to ripen, the feeding begins. The animals are divided into two ps, of which one comprises the two and three year old pigs and the g ones, the other group the females and the one and two year old ward males. The feeding of the animals follows a certain order and cilitated by knocking down the acorns with poles. Where this is done "dehesa" is generally divided into four parts and the acorns are ked down first in the lowest-lying part. The poles used have a stick hed to their upper end in such a way that it can move freely. The us are knocked down in the lowest quarter of the dehesa for about a ight, after which time the process is commenced in the second quarter another fortnight and so on. The pigs themselves show when the ent for knocking down the acorns has come and the workmen ged for this work must not commence it until the animals show their e to have the acorns. In some localities the acorns are not knocked n and the pigs feed only on the acorns that fall naturally to the ground. The amount to be paid for the acorns is settled in various ways; the usual is to fix a certain sum for each arroba (25.36 lbs.) of gain in the weight of the pigs, which are weighed at the beginning and at the end e time that they feed on acorns.

The second group, as said above, consists of the sows and of the one and year old backward males; these animals scatter all over the mountain feed upon the acorns which fall from the trees, or which have been left be ground by the preceding group.

3rd Region: Old Castile. — It includes the provinces of Valladolid, os, Segovia, Avila and Soria. The distribution of productive lands is llows :

Cereals	5 286 366
Fruit trees, olives, and market garden this	1 036 083
Forests and pastures	3 808 071

From the above it is seen that cereals are the prevailing crops.

The land is generally rented to the farmers. But of late years there is a tendency to replace the old traditional form, according to which the farmers handed down their farms from father to son, by short leases: from 2 to 8 years.

In other parts of the same region there is a tendency to form associations for mutual help: the poor peasants whose only means of production are their own hands and one draught animal join in couples so as to do work better with two animals than with one, and this irrespective of difference there may be in the land and in the animals; consequently there is no remuneration or compensation between the parties.

The agreements are generally private and only verbal, though of late as well as in the other regions there is a tendency to make written private agreements and even before a notary public. The duration of the contracts is generally three or four years for yearly crops, and up to five for forest properties.

4th Region: Aragon and Rioja. — It includes the provinces of S. gossa, Huesca, Teruel and Logroño.

The productive land is distributed as follows:

Cereals	3 494 803
Fruit trees, vines, olives and market gardens	1 541 490
Forests and pastures	6 228 755

In this region permanent grass lands and grass leys have a certain importance, the extent of land devoted to these being at least 74 000 acres.

As a general rule the dry lands under cereals, olive trees and vines are managed directly by the owners or their agents, while the irrigated lands are let, under the name of "torres" to farmers called "torreros" who generally pay their rent in kind (wheat).

In certain regions and in the event of damage caused by the weather such as frost, hail, floods or drought, it is the custom to diminish rent proportionally to the extent of the damage done. The amount of this diminution is settled between the lessor and the lessee or by valuation by an expert.

The legal form of these contracts is fixed by local custom; their duration is usually one year, and they are tacitly renewed until one of the parties gives notice of their cessation.

5th Region: Leon. — It includes the provinces of Santander, Leon, Palencia, Zamora and Salamanca. The acreage devoted to the various crops is the following:

Cereals	6 123 446 acres
Vines	162 773 "
Other crops	92 877 "
Forests and pastures	5 915 877 "

In this region the province of Santander has the one which possesses the greatest extent of permanent grass land, 112 000 acres.

In this province the properties are extremely subdivided; the least form of farming is that on the share system, though it exists in some cities; in this case the owner provides the seed and takes one third of the crops, the farmer bearing all the other expenses of cultivation. If the owner provides manures as well as seeds then he gets one half of the produce.

The chief wealth of this province lies in its live stock. One of the methods of rearing cattle is the share system, according to which the owner gives the farmer one or more head of cattle for a certain time settled upon beforehand between them. The farmer engages to keep the cattle, getting in exchange: a) the whole quantity of the milk produced, b) one half the value of the calves, c) one half of the increase of value of the animals. This increase in value is based on the value of the animals agreed upon by the parties at the beginning of the contract. If on the contrary there is a diminution of value or death of the cattle, the loss is sustained in equal shares by both parties.

In the rest of the region large estates prevail and renting is prevalent; rents are paid in kind (wheat); the agreements generally last five years and are for the most part renewable on the same conditions.

6th Region: Galicia and Asturias. — It is composed of the provinces of Orense, Pontevedra and Oviedo. Permanent grass lands are an important feature of this region, as may be seen from the following figures:

Cereals	1 991 605
Permanent grass lands	897 486
Fruit trees, olives, vines and market gardens	344 995
Forests and pastures	6 381 616

In this region landed properties are exceedingly subdivided and scattered, and the farms are rented without any limitation as to time; this form of leasing is called "foros" and "subforos"; nevertheless recent tendency has arisen to limit the duration of these leases, generally for years; when the time is not specified in the agreement, it is understood that it is to last all the time required to harvest the produce, even if it tends to two years or more, according to the rotation. The payment is most frequently effected in cash.

The following are data referred to a typical small farm of the region. According to the agricultural engineer above-mentioned, for a farm leased as follows:

Wheat	3.46 acres
Meadows	1.16 "
Kitchen garden	1.10 "
Uncultivated land	4.44 "

means of production, according to this degree of intensity of culture represented by per acre of the working capital are the following:

House furniture	7.6	per cent.
Material and implements	10 —	» »
Draught animals	28.5	» »
Productive animals	36.1	» »
Provisions for the family	9.5	» »
Circulating capital	8 —	» »

7th Region: Navarre. — It comprises the provinces of Navarre, Alaba, Vizcaya and Guipuzcoa. The productive lands are divided as follows:

Cereals	990 907
Grass lands	95 549
Fruit trees, vines, olives and kitchen gardens	85 536
Forests and pastures	3 084 190

In Guipuzcoa apple trees are cultivated to a great extent; their juice is used for the preparation of a cider called in the country "sagard".

In this region the small farms are worked by the owners themselves; the larger ones are rented or worked on the share system.

The social conditions are such that the agreements are almost all verbal and rest on the good faith of the contracting parties. There are however exceptional cases in which the agreements are drawn up in writing with all the usual formalities. Generally no caution money is required, but lately a surety is asked for. The contracts last six years or an indefinite period, and at the end of the lease the farms must be returned to their owner in the same state in which they were consigned.

In cases of loss of harvest due to hail or other weather causes the loss is diminished by mutual understanding between the parties; the good faith on both sides is evidenced by the fact that the owner delivers into the farmers' hands breeding and productive live stock for him to keep and utilize within certain limits, without the contract containing any clause contemplating a breach of trust on the part of the farmer.

8th Region: Catalonia. — It embraces the provinces of Barcelona, Tarragona, Lerida and Gerona. The productive lands are distributed as follows:

Cereals	1 854 958
Fruit trees, vines, olives and kitchen gardens	1 612 584
Forests and pastures	5 570 033

In this region the vineyards and olive groves are very important; the vineyards have been reconstituted on American stocks.

The share system prevails, not only in the farming of the land, but also in the keeping of live stock. The properties are not cultivated by the owners themselves except in the cases of very subdivided properties. The practice of renting the land is widespread but not so general as the share system, the duration of which varies from one year to an indefinite period, the custom being to give one year's notice.

In this region there exists a form of share system called "masoveria" which really partakes of the share system proper and of renting, because it entails payment of a sum in money besides dues in kind; but what characterizes the system is the fact that the farmer or "masover" inhabits the house belonging to the property, certain rooms which are set apart from him (he being charged with the upkeep of the house and annexed buildings: cellar, granaries, etc) and takes the produce of the small kitchen garden usually attached to the house, as well as the fire wood that he requires. As for the keeping of sheep on the share system, the owner and the farmer contribute equal shares for the purchase of the flock; if the pastures belonging to the property are insufficient, both parties contribute equally to the cost of the additional pastures; the salary of the shepherd is paid likewise by the owner, while his board is defrayed by the farmer; the cost of shearing is borne in equal shares by both partners, who divide also the profits or losses.

6th Region; Levante. — It includes the provinces of Valencia, Castellón, Alicante and Murcia. The productive lands are divided as follows:

Cereals	2 391 992
Fruit trees, vines and market gardens	1 788 499
Grass lands	201 428
Forests and pastures	3 243 503

In this region orange and fruit trees and market gardens are very important. The market gardens at Murcia occupy 26 600 acres, which are intensively cultivated; it is the same with the market gardens of Valencia and of Ortiñela in the province of Alicante.

Direct management by the owner is limited to the small farms. The prevailing systems are: leasing and the share system.

In the dry lands the duration of the lease averages 5 years, and the rent is usually paid in kind. These lands sown to cereals are called in the northern part of the region "white lands"; they are also worked on the share system and in this case the owner must: a) provide 75 per cent. of the seed; b) pay half the cost of hoeing and sometimes a part of the expenses of irrigation according to a fixed rate per bushel of seed, and lastly he must pay for the manure.

The farmer must: a) pay 25 per cent. of the land tax; b) plough the land three times in order to prepare it for the crop; c) defray the cost of irrigation and one half the cost of hoeing, reaping, cartage, threshing, cleaning and carrying to the granary. The owner gets one half the grain as his share and the farmer the other half and the straw.

The irrigable lands are farmed in a variety of ways according to local conditions.

The olive groves are not usually leased; the same may be said of the vineyards, which are farmed on the share system, usually for two years or more.

7th Region: Eastern Andalusia — It is formed by the provinces of Seville, Huelva, Jaén, Málaga and Cádiz. Its productive lands may be divided as follows:

Cereals	3 098 536 acres
Fruit trees, vines, olives and market gardens	1 443 293 "
Grass lands	621 295 "
Pastures and uncultivated lands	459 647 "

11th Region: *Western Andalusia*. — It includes the provinces of Seville, Cadiz, Cordova and Huelva. Its productive lands are divided as follows:

Cereals	3 968 542 acres
Fruit trees, vines, olives and market gardens	1 410 247 "
Grass lands	1 295 873 "
Pastures and uncultivated lands	4 937 505 "

These two regions may be considered together, as their systems of farming are the same.

The cultivation of the olive tree is very important in both of them.

Great estates are prevalent, and they are generally managed by the owner himself or his agents; nevertheless the practice of leasing the land of late been gradually extending. The lease is generally a six years' or sometimes a mortgage guarantee is required, or a personal guarantee with or without surety.

The least widely spread form of farming is that on the share system; there are however cases in which two farmers engage in a metayer agreement to farm an estate which they hold under the usual rent conditions. These agreements are generally made by a public notary.

As has already been said, large estates prevail in this region, and according to the engineer already mentioned, the working capital of a property of 2650 acres may be divided as follows:

Furniture	7.51 per cent.
Material and implements	19.56 "
Live stock	44.72 "
Provisions	13.20 "
Circulating capital	15.01 "
	<hr/>
	100.00
	<hr/>

The 12th and 13th regions comprise the Balearic and the Canary Islands; they are not described here, not being in the peninsula.

The Study of Colonial Agriculture in Italy

by

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Interest in colonial agricultural problems has only quite recently been awakened in Italy among the general public and the studious classes. It may be said that up to within a few years ago the study of colonial agriculture was almost completely neglected in this country and that during the last years it has received a powerful stimulus from the propaganda exerted in favour by a few students of the subject and still more from the newly felt by the country of a better knowledge of its growing colonial possessions and of the means of utilizing them better. The conquest of Eritrea succeeded better than the Eritrean and Somali colonies in causing agricultural research in the colonies to be held in higher consideration and bringing into prominence the few institutions which already for some time had devoted themselves to this study. And if it is useful to inform the public of the best work done in this branch of scientific and technical activity, it is not without interest to recall the beginnings of this salutary promising awakening, all the more so as these also belong to the past.

So long as the occupation of Eritrea was limited to the coast, there was no inducement to take up the study of the agricultural problems of the colony owing to the limited extent of the conquered territory and to its want of natural wealth. Thus the first step in the direction of colonial agricultural study dates back only to 1891, in which year, after the occupation of the Eritrean plateau, the Royal Decree of January 25 instituted a Colonization Office under the Councillor for Agriculture. Then at Asmara an Agricultural Experiment Station was founded, as a basis for colonizing the imperate districts of the Colony (1).

But the political events of 1895 and 1896 stopped the experimental work that had so auspiciously begun, and prevented the government from resuming the agricultural study of the colony in its imperate districts and from extending it to the torrid and semi-torrid districts. Thus it was not until 1901 that the interrupted work was taken up again when the Government of Eritrea entrusted an agricultural expert

Reports of Baron LEOPOLD FRANCHETTI, Member of the Italian Chamber of Deputies, on the work of the Bureau of Agriculture and Colonization of Eritrea, presented by the Ministry of Foreign Affairs in the sitting of March 3, 1893, and April 28, 1894.

with the task of reporting upon the agricultural possibilities of the important districts of the colony and of drawing up plans for a regular cultural experiment service. The Report (1), after having described various agricultural regions which make up the colony, the conditions of native agriculture and the natural resources of the country, proceeded to examine the crops and the live stock that might be raised with probability of success and lastly proposed the establishment of an agricultural experiment station in the Colony. The Report further expressed the wish that in Italy centres of cultivation and of study should be established with objects of keeping in close touch with the Agricultural Bureau, of preparing the experts necessary to exploit the Colony and of calling the attention of the public to colonial agricultural problems in general. At the same time in the year 1901 the first experiments on tobacco and cotton growing were made in Eritrea, the latter proving very satisfactory (2).

The Colonial Government approved the proposed Agricultural Experiment Bureau, which was founded in 1902, and in 1909 was incorporated in the Colonization Bureau. The activity of the agricultural experiment service has not been hitherto very marked; nevertheless the first results of experiments with exotic plants, and a more accurate study of some regions have enriched our agricultural literature by some valuable volumes whilst the collections of vegetable products, both spontaneous and cultivated, and of the products of animal husbandry prepared by that Bureau for the exhibitions of Florence, Ravenna, Asmara, Milan, and Turin, carefully illustrated by well arranged catalogues (4), showed in their light the agricultural possibilities of Eritrea.

(1) DR. GINO BARTOLOMMEI GIOLI. *L'Agricoltura nell'Eritrea*. Report to the Royal Civil Commissioner. Later republished in the *Bollettino dell'Emigrazione*, No. 16, Year 1901 under the title: *Agricoltura e Colonizzazione nell'Eritrea*. On the same subject: G. B. GIOLI. *Le attitudini della Colonia Eritrea all'agricoltura*. — *Atti della R. Accademia dei Fisiocritici*, 1912. DR. G. B. GIOLI. *La colonizzazione agricola dell'Eritrea*. — *Atti R. Accademia dei Georgofili*, 1903.

(2) AURELIO PAOLETTI. *Resultati degli esperimenti di colonicoltura eseguiti nel 1900-01*. attached to the *Relazione su la Colonia Eritrea del R. Commissario Civile Straordinario*, 1900-01.

(3) BALDRATI, I. *La coltivazione del sesamo nella Colonia Eritrea*. From the *Rivista Coloniale*, 1906, p. 8.

BALDRATI, I. *L'arachide*. Abstract from *Agricoltura Coloniale*, 1907.

BALDRATI, I. *L'Agave sisalana*. From *Agricoltura Coloniale* 1907.

BALDRATI, I. *Le piante tessili della Colonia Eritrea*. From *Almanacco dell'Italia Africana*, p. 11.

BALDRATI, I. *Le condizioni agricole della valle del Barca*. *Biblioteca Agraria Coloniale*, N. 1. Edizioni dell'Istituto agricolo coloniale italiano, Firenze.

(4) BALDRATI, I. *Catalogo illustrativo della Mostra agricola dell'Esposizione Orientale di Firenze, anno 1903*. Appendici: *Indice della mostra zoiologica del R. Istituto Botanico di Firenze*, anno 1903.

BALDRATI, I. *Catalogo illustrativo della Mostra Eritrea nella Esposizione Internazionale di Milano*, 1906.

besides the work of the Agricultural Experiment Bureau, special researches on questions concerning live stock and forestry (1) must be done, as well as the solutions given to some technical problems by agricultural undertakings, such as cotton plantations (2). There is no doubt that the agrological study of Eritrea, to which geobotanists, hydraulic engineers, economists (3) and jurists have concurred, has not only aroused the interest of the public in such researches, as also favoured the formation of a nucleus of experts in colonial agriculture.

Italian Somaliland, though from the political point of view more forceful than the older colony, may be said to have been opened up to agricultural investigations only during the last few years; during the first [of our effective occupation the modest Agricultural Bureau which was then installed there, was not in a position — for several reasons — to do the work for which it had been founded, and had to confine itself to a summary study of the limited extent of territory then accessible to investigation. But later, in 1910, when the extent of territory occupied had increased and the inhabitants had been pacified, the present government reorganised the experimental agricultural service by an Advisory Bureau for agricultural undertakings, from which the experimental service depends. Notwithstanding the fact that the Advisory Bureau has only been a few years in existence, the work which it has accomplished, as it appears from some important reports (5), promises useful results; it follows a plan based on the same lines as those adopted by the neighbouring English and German colonies, but aiming at the same time at giving agricultural colonization in Somaliland a special character corresponding to climatic and hydrological conditions of the country and to our particular ethnological and economic tendencies.

MARCHI, EZIO. *Studi sulla Pastorizia della Colonia Eritrea. Biblioteca Agraria Coloniale*, 12. dell'Istituto Agr. Col. Ital. 1910.

DEI, ADRIANO. *Boschi e piante legnose dell'Eritrea. Biblioteca Agraria Coloniale*, No. 7. dell'Ist. Agr. Col. Ital. 1912.

Società per la Coltivazione del cotone nella Colonia Eritrea, *Cosa si è fatto nei primi anni*. GINO LAVELLI DE' CAPITANI, relatore, 1909.

The following publications are worthy of special mention:

OLA COLETTA, C. E.: *Sull'utilizzazione a scopo d'irrigazione delle acque del fiume Gasc nella Eritrea*.

OTTO DAINELLI and OLINTO MARINELLI: *Resultati scientifici di un viaggio nella Colonia Eritrea*. Istituto di Studi Superiori Pratici e di Perfezionamento di Firenze, 1912.

Giornale Economico: a cura della Società di Studi Geografici e Coloniali di Firenze, Edit. dell'Istituto geografico De Agostini, Novara, 1913.

DARDO BECCARI: *Le Palme del genere "Raphia"*, *Biblioteca Agraria Coloniale* No. 2. dell'Istituto Coloniale Italiano 1910.

CESARE MACCALUSO. *L'agricoltura nella Somalia Italiana meridionale (Benadir) in* *il Ministero Affari Esteri*, Anno 1908. Rome, 1908.

ROMOLO ONOR. *Allegati alle Relazioni del governatore della Somalia Italiana presentati* nel 1910 e 1912.

The researches of scientists and of technical experts in geology, hydrology, hydraulics and natural science that have already appeared (2), those that will be published (2), support and complete the work of the Advisory Bureau, as the juridical study of the tenure of land will supply the basis for the regular preparation of agricultural colonization.

It will be well now to refer briefly to the work begun by Italians to illustrate the physical, agricultural and economic conditions of Libya, and examine what results are likely to be attained by agricultural undertakings. Many works of compilation have recently been published with the object of showing the agricultural and economic value of the colony, but hitherto only a few are original and the result of serious research carried out on the spot by experts. Among these the Report (3) of the Agrological Mission sent to Tripoli last year by the Ministry of Agriculture, Industry and Commerce is worthy of special mention. This report is the most complete contribution to the study of the Tripoli district from the agricultural point of view as well as from the botanical, hydrogeological and zootechnic. This statistical work leads us to expect equally good results from two other agrological missions sent in February of this year to Tripoli in order to continue the studies and researches. Of these two missions one is official (4); the other is sent with a similar object by the Italian Association for the study of Libya (5).

Within a few months Cyrenaica will be open to research and the harvest of data collected in a praiseworthy work of a correspondent of the Istituto Agricolo Coloniale Italiano at Bengasi (6) is a guarantee of the importance and novelty of the agricultural problems which that province offers to the students.

Much less important than the above mentioned are the contributions by our investigators to the solution of the agricultural problems of foreign countries. And while our emigration beyond the limits of Europe

(1) GUIDO MANGANO and G. ROSSI, *Studio analitico di alcuni terreni della Somalia meridionale*. Edizioni Istituto Agricolo Coloniale Italiano, 1909.

II^o Congresso degli Italiani all'Estero, Roma, 1911. Sezione VIII. Relazioni varie.

(2) The results of agricultural enquiries carried out during 1911-12 by Drs. G. Sassi and N. Mazzocchi are now in the press.

A mission composed of Professors G. Stefanini and G. Paoli is at present in the country engaged in a study of the country from the point of view of the naturalist and the hydrologist.

(3) Ministero di Agricoltura. *Ricerche e studi agrologici su la Libia*. - La zona di Tripoli. Relatori DE CILLIS, FRANCHI, TROTTER e TUCCI.

(4) Members of the Commission are the following Professors: Parona, Cava, Crea, Crema, De Cillis, Di Tella, Drago, Eredia, Franchi, Odifredi, Peglion, Simonetti, Trotter, Valenti. Secretary: Mazzocchi.

(5) The mission under the leadership of Senator Baron Leopold Franchetti is composed of Professors Gugnoli, Manetti, Pampanini, Pucci and Stella.

(6) CARLO MANETTI. *Appunti di Agricoltura Bengasi*. Ministero degli Affari Esteri, Ufficio di Studi Coloniali, No. 22, Novembre 1912.

ly, towards the end of last century, succeeded in creating strong and thriving colonies abroad it had not promoted among the governing classes in the mother country any decided inclination towards those problems that people so bravely faced and often successfully solved.

The character of our emigration, chiefly proletarian, its extent, and the difficulties attendant upon the technical and scientific study of distant countries, did not induce Italian students to devote themselves to cultural colonial questions; they have only lately received an efficient stimulus to face these problems when a better understanding of the task to be accomplished by our colonies has given a more solid basis to our study in them.

It is thus to this last period that some important studies made by Italian agronomists on North and South America, on Australia and on some parts of Africa belong. These works are mainly intended as material for the preparation of plans of colonization, but sometimes they are the result of investigations that have no exclusively speculative object (1).

After this brief review of the work done by our students in the field of technical research in the colonies, it will be well to see what has been done in the mother country to promote and organize this new order of investigations with the object of providing agricultural colonization with indispensable technical knowledge.

In the domain of botany applied to colonial requirements two institutions of especial assistance for colonial investigations, namely the Royal Botanical Garden at Palermo and the Royal Colonial Museum and Herbarium of Palermo, both of which are annexed to the respective Botanical Institutes. The latter was the first Institute of colonial scientific character established in Italy (1904). Its objects are: to collect in the colonies belonging to Italy, specimens of the flora and of the useful and utilizable plant products connected with them. The Institute further studies these collections (2) in order to acquire a more complete knowledge of the resources of that flora; the usefulness of this work will be easily understood and is further shown by the numerous botanical publications and some agricultural ones issued by the Institute (3).

The Royal Botanical and Colonial Garden at Palermo aims chiefly at propagating, cultivating, improving and spreading those plants which have economic or industrial importance for Sicily or for our African colonies. It began to work regularly in 1907 when its buildings and

In this connection see: *Bollettino dell'Emigrazione*, published by the Commissariato dell'Emigrazione, *L'Agricoltura coloniale* of the Istituto Coloniale Italiano of Florence, *La Rivista Agricola*, organ of the Istituto Coloniale Italiano of Rome, and several agricultural periodicals of the Colonies.

The activity of the Institute is shown by the numerous publications, mostly of technical character, which have appeared in the Annals of the same Institute and in several botanical periodicals.

See the publications of the Bureau of Colonial Studies of the Ministry of Foreign Affairs and other periodicals.

grounds were enlarged. Some investigations on rubber plants, completed, the possibility of cultivating *Agave sisalana* in Sicily ascertained, and other exotic plants were spread. The study on cork was resumed and new hybrids were made and tried in Sicily. Numerous reports, monographs and investigations bearing more or less upon cork subjects and published in the organ of the Royal Botanic and Colonial Garden and other periodicals (1) bear witness to the activity of the institution. In order to place this garden in a position to meet the recent requirements of the task of utilizing our colonies, a Bill has been presented to Parliament with the object of ensuring its existence and voting the necessary funds for its more practical and efficient action.

Lastly, the only Italian colonial institution of a purely agricultural character will be mentioned. In founding it, its promoters contemplated filling up a gap in our educational institutions, which was the principal cause of our want of preparation for the work of exploiting our new colonies. In 1904 the preliminary work was begun for the foundation of an imperial Italian colonial agricultural institution having the following aims: to be a centre of information, advice and propaganda for all matters dealing with the agriculture, animal husbandry and natural resources of the political colonies; to prepare the higher and subaltern staff for colonial agricultural and live stock farms; to complete the Government agricultural experiment work in our territorial colonies; to introduce into Italy new technical systems of farming and of live stock raising as well as plants and animals from extra-European countries; to study improved methods of sowing and of breeding that had already been introduced into Italy, but not yet been sufficiently experimented; lastly to get into touch with foreign institutions for the exchange of material and of information. A part of this extensive programme was carried into practice in 1906, and in 1908 the Italian Colonial Agricultural Institute was in full working order. Today one of its branches is accomplishing an ever increasing amount of work thanks to the financial help of Government and local bodies and the support of other Florentine institutions (2). It possesses abundant demonstration material collected in its museum of agricultural produce, and is provided with a library, laboratories, hothouses, and a staff that has been well trained by much study and by travel in the colonies. Five years ago a theoretical-practical school of colonial agriculture for the young men has been opened through the practical schools of agriculture or the agricultural section of the Royal technical institutes, was opened and most of its graduates have found satisfactory employment in farms belonging to private persons or to companies or in government offices in Eritrea, Somaliland, Be Africa, Nyasaland, Malacca, Argentina, Brazil, Texas, Montenegro. But the educational function of the Institute is becoming gradually

(1) See *Bolettino del R. Orto Botanico e Giardino Coloniale di Palermo* and the publications of the Bureau of Colonial Studies of the Ministry of Foreign Affairs.

(2) Among these the following deserve special mention: The Royal Botanic Institute, the Royal School of Pomology and Horticulture, and the Royal Station of Agricultural Experiments.

plete by the addition of higher courses. Thus last year a course of veterinary pathology was instituted for doctors in veterinary science, the results were most encouraging. This year a higher course of colonial agriculture will be added for men holding a doctor's degree of the higher schools of agriculture and will be chiefly devoted to our African colonies, while separate lectures or series of them will continue, to be on various subjects and on the agricultural conditions of those countries beyond the seas to which our emigration flows.

Besides the above educational work the Institute has published for the last seven years the *Agricoltura Coloniale* and a series of colonial agricultural works, of which already eight volumes have appeared (1).

It publishes also reports and colonial agricultural monographs and by means of its agricultural experimental service it furnishes plants, new seeds, rearing animals, and gives advice and information. It possesses also a chemical and technological laboratory, hothouses and land for experiments.

The Institute has prepared several missions for the agricultural study of the colonial districts and has drawn up programmes for missions; the latter the plan for a mission intended to study Libya (2) from an agricultural point of view, and which was presented to the Ministry of Foreign Affairs in the autumn of 1911, is to be mentioned, whilst among the other it is worthy of note that the Institute has supplied technical and scientific experts for exploitations in British and German East Africa, India, Java, Italian Somaliland, Eritrea, Libya and Angola. Nor must be forgotten that the Ministry of Agriculture, Industry and Commerce has commissioned the Board of the Institute to represent Italy at the International Congress of Tropical Agriculture at Brussels in 1910 (3) and that the Institute works in close connection with other kindred Italian institutions in the field of agricultural investigations.

From the above summary it will be seen that the Institute is at present the best adapted to promote the study of colonial agriculture in Italy and is one which has made the greatest number of scientific and practical contributions during the last five years to the study of colonial agriculture.

Besides the works previously mentioned there are the following:

ETTO MANETTI, *Istruzioni per la raccolta d'informazioni e di prodotti agrari nei paesi esotici*. No. 3.

A BALDRATI, *Le condizioni agricole della valle del Barca*. No. 4.

GERMANN MORESCHINI, *Istruzioni per la coltura del cotone nell'Africa*. No. 5.

ETTI, OBERTO, *Le colture aride, "Dry Farming"*. No. 6.

LA BAUME, and A. MORESCHINI, *Le cavallette africane*. No. 8.

Progetto di Missione di Studio in Libia. Relazione a S. E. il Ministro degli Affari Esteri, Direzione dell'Ist. Agr. Col. Ital.

DI BARTOLOMEO GIOLI, Ufficio di Studi Coloniali, No. 14. July 1912.

GIULIO MANGANO, *L'opera del Comitato per la partecipazione dell'Italia al 2° Congresso Internazionale di Agronomia Tropicale*. — Brussels 1910 - Relazione a S. E. il Ministro di Agricoltura e Commercio.

Want of space does not allow us to mention other secondary, but missing, symptoms of the reawakening in Italy of interest in the colonial agriculture, because they manifest themselves in so many that they cannot be succinctly described. The daily press, the technical and scientific periodicals, as well as congresses, academies, libraries, colonial, geographical and speculative institutions (1), all devote a part of their activity to agricultural and colonial questions and draw the attention of the public to technical problems which it had not been in the habit of considering.

Viticulture in Hungary

by

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When the Hungarians, on coming from Asia, took possession in the ninth century of the present country of Hungary, they found vine-growing prosperous there, this industry having been introduced in the third century by the Emperor Marcus Aurelius Probus into the Roman Province of Pannonia. Although on first occupying Hungary the Hungarians led a somewhat nomadic life, there were amongst them, already in the tenth century, numerous vine-growers and agriculturists. Béla IV, King of Hungary, founded in the thirteenth century, in the neighbourhood of the colonies of Italian vine-growers; these imported from the district of Fiume cuttings of the "formint" vine, which received the name of their city afterwards became the parent-variety of the celebrated Tokay wine.

The conditions of soil and climate obtaining in Hungary are very favourable to viticulture, which became increasingly prosperous both in the various mountain districts, and on the plains and sandy hills.

Unfortunately, phylloxera is spreading rapidly over all the neighbouring countries of Europe, did not spare Hungary. Its first appearance was recorded in 1875 in the southern districts of the country, notably at Székesfehérvár, and in spite of energetic measures (the uprooting of the infested vines) it proved impossible to eradicate the pest. From 1880 the ravages of the insect extended to other districts.

According to the data of the survey made on the appearance of phylloxera, vines then occupied 1 050 978 acres, of which 884 371 acres were in Hungary proper, and 166 606 acres in Croatia-Slavonia.

(1) Reale Accademia dei Georgofili, Florence. — Istituto Italiano per l'Espansione Agricola e Commerciale, Venice. — Istituto per gli Scambi Internazionali, Genoa. — Società Nazionale d'Italia, Naples. — Istituto Coloniale Italiano, Rome.

In 1884, the area under vines increased to 1 076 446 acres, which proves at that date more vines had been planted than had been destroyed by *oxera*; but since 1885 the number of newly planted vines no longer compensated for those destroyed by the parasite. In 1895 the vineyard had decreased to 606 150 acres. Since the latter date, however, the restitution of the vineyards which had been destroyed and the planting in the sandy districts has received a fresh impetus, and in 1911 the area under vines in Hungary was 883 924 acres. The following figures give the total vineyard area according to the returns and the amount of wine produced in Hungary.

Area in acres			Wine production in gallons		
Hungary proper	Croatia Slavonia	Hungary State	Hungary proper	Croatia Slavonia	Hungary State
908 103	168 101	1 076 204	132 554 246	29 257 800	161 812 046
768 466	133 079	901 545	83 383 175	8 142 068	91 525 918
614 588	140 308	754 921	19 471 474	4 566 650	min 24 038 124
501 077	105 074	606 150	47 152 556	6 413 616	53 566 172
514 938	98 173	613 111	27 820 188	4 083 904	31 904 082
547 939	94 816	642 756	40 135 964	7 351 740	47 487 704
636 719	105 691	742 410	77 424 468	16 311 416	93 735 884
715 344	98 380	813 724	159 170 286	36 872 616	max 196 042 902
753 725	111 049	864 774	62 143 730	5 442 514	67 586 244
770 778	113 146	883 924	101 549 668	19 177 730	120 727 198

n Hungary proper the area of vineyards, in 1911, was divided as fol-

a) Vines grafted on American stocks resistant to phylloxera . . .	259 350 acres
b) Vines treated with carbon disulphide	99 889 "
c) Other vines in compact soil	94 317 "
d) Vines planted in sandy soils	317 222 "

Total . . . 770 778 acres

The figures relating to these categories in Croatia-Slavonia are not yet n. On account of the ravages of phylloxera and mildew, the annual production of the State of Hungary varied from 1891 to 1900, between 8 124 and 53 566 172 gallons. Nevertheless, since the beginning of

the twentieth century, the work of the reconstitution of the vine which had been destroyed and the plantation of new ones has developed uninterruptedly, so that in spite of frequent misfortunes, Hungary produced between 1907 and 1911 an annual average of 116 738 600 gallons of wine of which 95 622 714 came from Hungary proper and 21 115 886 from Croatia-Slavonia.

From the time of the phylloxera invasion, the Hungarian Government has frequently sent experts to study the control measures adopted in France and has lost no time in taking energetic measures which assure and still continue to assure, to our vine-growers efficacious and valuable assistance.

In order to destroy the first centres of infection, the State paid compensation to the owners for all the vines which were up-rooted. This measure had not, however, the desired results. At the present day, the control methods most employed in Hungary are ;

1. Planting vines grafted on phylloxera-resistant American stocks
2. Treating the vines annually with carbon disulphide.
3. Planting on sandy soil where phylloxera cannot exist. Such an area occupies vast areas in Hungary. These three measures were adopted with the efficacious assistance of the Government. At first, American direct bearers were also used, and the submergence of the infected vineyards was practised, but at the present time both these expedients have been abandoned. In Hungary, American direct bearers are not in favour; further, their resistance is doubtful, while as the vineyards most attacked by phylloxera are situated on the mountain slopes, their flooding is an impossibility.

In order to preserve the old vineyards which have been infested with phylloxera, the Government undertakes to supply cultivators with all necessary directions for the carbon disulphide treatment and to facilitate the purchase of insecticides and of injectors. To this end it first imported carbon disulphide from abroad; and later, in 1886, it established a national factory at Zalatna (Transylvania) which was afterwards followed by another established at Pozsony by the Dynamite-Nobel Society. These factories are able to supply the demands of the country. Further, the Minister of Agriculture has installed in the different vine-growing districts of Hungary stores of carbon disulphide (there are at present 104) coming from the two above-mentioned factories. The cost of the transport from the factories to the stores is defrayed by the State.

In some of the vine-growing districts, the Minister of Agriculture has established model vineyards which are treated with carbon disulphide in order that those interested in the systematic use of this remedy may see the results that may be obtained. In 1911, the area of vineyards treated with carbon disulphide in Hungary amounted to 99 815 acres, of which the greater part was newly planted.

In order to spread the prophylactic measure of using American stocks which are phylloxera-resistant, the Minister of Agriculture has planted many experimental fields in the country; he has also taken trouble to raise in State nurseries, and place at the disposal of vine growers the stocks necessary

reconstituting vineyards. The stocks and grafts of American vines used in these nurseries are on sale every year at moderate prices ; but in order to prevent speculation, they are only sold to vine-growers for use in their own vineyards.

The experiments made have proved that *Riparia Portalis* (Gloire de pellier), *Vitis Solonis*, *Rupestris Monticola* and *Rupestris Metallica* the best results as stocks ; these varieties are also grown by preference in the State nurseries. About 2 500 000 grafts and from 40 to 50 million cuttings are produced annually.

In addition to the State nurseries, these are others made by the communes, municipalities, viticultural associations and also by private individuals ; these enjoy the support of the Government and also place on the market every year many millions of cuttings and of scions for grafting. The grafts are usually whip-grafts. In some regions, herbaceous grafts are also made in the following way : American vines on their own roots are planted in the nursery, and in the following June, the green scions are grafted upon them ; while in the autumn of the same year, the grafted vines are planted in the vineyards.

The law of 1896, which was passed for the encouragement of vineyard reconstitution, gave a great impetus to vine-growing in Hungary. This law allowed vine-growers to obtain the funds necessary for reconstituting by means of loans granted without guarantee at a relatively low rate of interest, and under advantageous conditions which would have been impossible without the assistance of the State which assumed the responsibility of these loans. The latter were made by a special Committee composed of delegates of the Ministries of Agriculture and of Finance, and of representatives of the Hungarian " Banque Agraire et des Rentes ", which at once provided the funds.

According to the provisions of the above-mentioned law, loans for the reconstitution of vineyards could be granted until the end of 1910. After that date, they have no longer been obtainable.

These loans, which are redeemable at 5.25 per cent, offer two advantages over other mortgage loans, viz. : the loans are not made in bonds, but the whole sum is paid in cash ; on the other hand, repayment is not required until the vineyards begin to bear (but must be made not later than November of the fifth year reckoned from the payment of the first instalment of the loan), unless the borrower wishes to anticipate the repayment. Repayment is made in fifteen annual payments due every 1st of November. Loans have only been granted for the purpose of the reconstitution of vineyards attacked by phylloxera and upon the condition that either vines of American stocks are used, or else European vines treated with sulphide. From 1897, the date of the first loans, until the end of 1910, when loans were no longer made, 9099 vinegrowers received on the sum of £ 1 252 530 for the reconstitution of vineyards occupying an area of 17 042 ar. cad. (about 24 700 acres).

These loans have had a good effect both upon the reconstitution of vineyards and the propagation of systematic vine cultivation.

The fact that the borrowers are obliged by the terms of the law to cultivate their vineyards in a systematic manner according to a prescribed method of management, and are under the control of experts, until the whole loan is repaid, has largely contributed to systematic cultivation, even those vine-growers who have not borrowed money, are quickly learning the principles to be followed.

Before the invasion of phylloxera the importance of sandy soil for vine-growing was unknown in Hungary.

Since the immunity of sand has been recognized, the vine-growers are increasingly encouraged to make experimental plantations on sandy soil. These experiments have shown that excellent wines can be obtained from vines growing on the latter, provided the vines are carefully selected, that the rules of systematic cultivation are observed. From this the great impetus was given to vine-growing on sandy soil and land with shifting sand, which was once valueless, is sold at prices which could never have been obtained before the appearance of phylloxera.

The credit of having taken the initiative in this matter belongs to the Government. In 1883, it established the first nursery and the first experimental fields on sand, thanks to the patriotic generosity of the town of Kiskemét which gratuitously made over to the State an area of 284 acres which received the name of "Miklós telep" (the Miklos nursery). This measure was destined to save the excellent Hungarian vines (1).

Further, towards the end of last century, the Minister of Agriculture divided, under very advantageous conditions of payment, an area of 709 arpents (7109 acres) on the national domain of "Deliblat" (Canton of Temes) amongst the vine-growers who had suffered from phylloxera. It also obtained for them, under very favourable conditions, other vineyards with sandy soil (2943 arpents cad.) 4184 acres in the counties Komárom, Fejér, Somogy, Pest-Pilis-Solt-Kiskun, and Szabolcs.

According to official statistics there were, in 1911, in Hungary 317,222 acres of vineyards on sandy soil, most of which had been replanted since the phylloxera invasion.

After phylloxera, mildew and *Conchylis* have caused most injury to Hungarian vineyards; the former made its appearance in 1891, while the second was first recorded some years ago. At present, the use of Bordeaux mixture as a remedy for mildew is widespread throughout the country. In 1911, 716,191 acres of vineyard were sprayed with this compound. Thanks to the intervention of the Hungarian legislation, these newly replanted vineyards enjoy exemption from taxation for ten years, no matter what method has been adopted in their reconstitution. Those replanted in sand enjoy 6 years exemption.

In Hungary proper, there are at the present time 8 National Schools for Vine-Growers founded by the State and grouped into two categories: primary schools for practical and theoretical instruction, and

als for practical instruction only. The course at the first is 2 years, at the other is one year. In all these schools, instruction is free, and of the students also enjoy free board and lodging. For the purpose of educating and developing the systematic handling of wines, the State purchased in 1901 at Budafok, in the vicinity of Budapest, a Special School for Cellar Masters, with large cellars capable of storing 1100 000 litres of wine. The vintage of the State vineyards and experiment fields is sent to these cellars, where are to be found types of all the best wines of the country. The school course lasts for 5 terms. In order to be admitted the candidate must have successfully taken a two years' course in a growers' school. The course is free, and poor and deserving students receive some assistance. Besides the cellar-masters' course at Budafok, there are travelling cellar masters who, at the request of the vine-growers, visit their cellars and impart the necessary instruction for the systematic handling of the wine.

In addition to the schools, there are periodical courses organized by the Inspectors of Viticulture which also serve to spread the principles of the culture and of systematic wine-making.

The higher instruction devolves upon the Superior Course of Viticulture and Wine-making instituted at Budapest in 1892. To this are only admitted pupils who have passed through the Superior Agricultural Insti-

tute. We must also mention the Central Ampelological Institute founded in Budapest in 1900. Its work is divided into 4 sections: a) plant biology and pathology; b) chemistry; c) zymotechnology; d) practical vine-growing. The results of the experiments, researches, and scientific studies of the Institute are published in its Annals. In 1911, the Institute examined 100 samples and wrote 4282 letters of information.

Amongst the Hungarian wines, the most celebrated and the best is Tokaji asszu which has a world-wide reputation and well deserves the name of "king of wines". Its natural sweetness is due to the fact that the grapes are allowed to dry on their stems.

Szomordui de Tokay is also an excellent dessert wine; it is not very strong, but is strong, full-bodied and aromatic. The new Hungarian wine law of 1908 has delimited the Tokay-growing district, which only consists of 31 communes. This law insures to purchasers that the wine they buy in the Tokay district is the product of the region which is delimited.

Other vine-growing districts of Hungary also produce excellent dessert wines, and even in good seasons, natural sweet wines, but the quality of these is much inferior to that of the Tokay wines. The Transylvanian wines made from Rhine Riesling, Sauvignon and Semillon are especially valuable; their quality rivals that of the celebrated Rhine vintages. Hungarian wines have long been known abroad. The adjoining table gives some figures relating to the foreign trade in Hungarian wines, and the quantity and total value of the must and wines exported in casks and bottles.

Year	Exports	Imports	Exports	Imports
	Gallons	Gallons	£	£
1885	23 337 336	1 975 468 (min)	1 072 907	600 656
1888	32 846 814 (max)	3 521 408	1 521 226	984 836
1890	29 471 794	5 065 192	1 946 560	1 155 423
1892	15 898 102	15 951 056	1 428 545	1 070 623
1893	17 158 020	16 957 072	1 634 977	848 075
1897	17 239 552	28 969 418 (max)	1 447 899	1 282 896
1899	13 415 732 (min)	27 107 960	1 128 215	1 220 773
1900	16 258 176	20 063 076	1 377 969	1 019 010
1903	18 290 602	8 078 554	1 227 798	392 677
1908	21 989 792	7 659 212	1 199 406	381 160
1911	31 467 634	4 844 686	2 394 822	399 590
1912	32 817 136	7 446 736	2 892 894 (max)	632 197

The gradual diminution of the exports since 1888, in which year it attained their maximum, is chiefly due to the ravages of phylloxera which much reduced the grape crop. Between 1900 and 1908, the exports again showed a tendency to increase; in 1912 they reached 32 817 136 gals., worth about £2 892 894, which is greatly in excess of the value of the wine exported in preceding years. As for the imports, they increased considerably from 1891, and attained their maximum in 1897; this must be attributed partly to the perceptible decrease in the national production, and partly to the effect of the commercial treaty concluded between Austria-Hungary and Italy.

According to this treaty, which came into operation in 1892, and was in force until 1904, the contracting Powers reciprocally reduced the duty on all wines entering the country in casks, viz: Italy reduced the tax from 8.65*d* to 2 ½*d* per gal. and Austria-Hungary in the case of some classes of Italian wines, from 18.17*d* to 2.9*d* per gal. Nevertheless, owing to the rapid increase of vineyard reconstitution, the importation of wine continued to be increasing, and in 1912 was only 22 per cent. of the exportation.

Lately, the Government has also been engaged in providing the vine growers with facilities for the sale of their wines and the increase of the production. For this purpose, it has decided to establish in the chief vine-growing districts of the country 10 large national cellars where the producers could deposit and sell their wines. Most of these cellars will be opened

The production of dessert grapes has of late years received a great impetus. The following table gives some figures respecting the foreign trade in this fruit.

Year	Exports	Imports	Exports	Imports
	cwt.	cwt.	£	£
.....	93 922	2 073	64 106	1 747
.....	104 526	3 580	106 454	4 285
.....	51 478	13 267	65 270	23 546
.....	87 036	41 511	73 590	32 032
.....	218 486	25 782	144 186	17 514
.....	290 706	15 993	183 830	6 947
.....	155 622	8 659	147 347	7 197
.....	221 386	8 418	209 997	7 363

The manufacture of sparkling wines and of brandy (cognac) is also considerable. In 1911, 265 166 gals. of Hungarian brandy, worth £104 752, 6 580 gals. of sparkling wines, valued at £25 984 were exported. On the other hand, in 1911, 42 440 gals. of brandy, worth £29 454, and 103 026 of sparkling wines, worth £59 211, were imported into the country. Hungary, which is jealous of the good reputation of its wines, takes more measures for the repression of fraud than most other wine-producing countries. The first Hungarian law concerning wine adulteration promulgated in 1893, abrogated in 1908 and replaced by a new law XLVII of 1908 which came into force on January 1, 1909). The important provisions of the latter are concerned with the prohibition and restriction of the addition of alcohol and of sugar. The effect of this legislation has already begun to make itself felt. Statistics also prove, as we have shown, that there has been a considerable increase in the export of Hungarian wines and of their price during the years that have elapsed since the new law came into force, which is a

The Present State of the Question of Inbreeding in Germany

by

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The term "inbreeding" (Inzucht) was formerly frequently used to mean breeding of pure races (Reinzucht or Rassenzucht), whilst today it is limited to the persistent pairing of nearly related individuals. And whilst further extended inbreeding ends in becoming a simple breeding of a race, still it is always desirable for the greater clearness of the question that under the term "inbreeding" the blood relationship be clearly understood. For consanguineous breeding in the narrowest sense German breeders continue to use term "incest" (Inzest).

According to passages of Aristotle and Ovid it appears that the ancients did not scruple to practise the closest consanguineous unions. From the middle ages but few documents have come down to us containing views of breeders on the subject; and while some writers recommend inbreeding others pronounce against it. In horse breeding it may have been employed according to a well-thought-out plan, but in general the conditions of the middle ages were not adapted to the application of carefully studied principles. The frequent cases of inbreeding occurred without any system being followed, out of sheer ignorance of its danger or of indifference and also from the impossibility of changing our conditions.

In England, as is well known, systematic inbreeding was largely practised with the object of forming improved breeds endowed with certain qualities, but it would be an error to believe that in England the system has no opponents or that it was always attended with success. Notwithstanding the greater experience of English breeders and the extension of past inbreeding favoured by the climate, there has been no lack of warnings raised in England against the evil consequences of inbreeding. And while, for instance, CULLERY was convinced of the innocuity of properly conducted inbreeding, JOHN SINCLAIR, PRINSEP, SEBRIGHT and others insisted that continued inbreeding would be followed by debility, disease and sterility.

In France, also, the chief breeders have expressed their opinion on the question. SANSON recognises in inbreeding a powerful means of improvement. CORNEVIN communicates a whole series of facts of his own experience and is not inclined to take the dangers of inbreeding too seriously. On the other hand BARON believes that a too long continued use of inbreeding leads to sterility. On the whole the opinions of the leading French breeders seem to differ quite as much as they do in Germany. At present, there is no doubt that in the matter of thorough research for

tion of the question the greatest progress has been achieved in many.

It is beyond discussion that in the old times of German stock breeding inbreeding was not at all discountenanced. The former tendency great stress on complete purity of breed and looked askance at cross-

In such a state of affairs frequent inbreeding was the result and it approved of even among the nearest relations (In zest), provided it was used among perfectly sound animals. Owing to the partially very results obtained by crossing with English blood, the theories of pure line and of constancy were shaken, and inbreeding which was one of the points of the programme fell into undeserved discredit. Stress was upon the unsuccessful results which inevitably follow on haphazard breeding, and which in Germany were all the more to be expected as almost everywhere stall keeping prevails and the interests of agriculture are dominant. Finally the great value of a national building up of blood breeding was no longer recognized, and even now it appears that in breeding stock more stress is laid upon the absence of consanguinity than upon any other point. There came a time in which the individuality was considered more than anything else, and the science underwent a far-reaching development. The performance tests were introduced, and now-a-days there is a partial return to the ideas of the old times on the constancy of characters which laid so much value on the same. Only that the latter is now, more than in previous decades, combined with inbreeding and the care bestowed upon certain lines of blood. This development need not convey the impression of gropings in the dark.

The development of individual examination was certainly not without, and the sharp insight of the breeder can never be replaced by pairing according to tables of pedigrees. Anyhow it is too radical to maintain that it is impossible to draw any conclusion as to performance and breeding from the outer appearance of the animals. The pedigrees point out the way to a systematic building up of the breed, but for judging the value of an animal the decision will always be given by the outer conformation by the performance.

It may be that the great importance attributed by breeders to ancestry pedigree may be due to studies on human conditions. Genealogy, which has become a special science, seeks and examines the descent and family relations of men, making use of chronicles, ecclesiastical records, of corporations and the like. Many historical events become psychologically intelligible only when the families (together with their characteristics) of the principal actors are known.

Genealogical science has also investigated inbreeding, and very important knowledge has thus been gained. In the first place research on individual families have shown how tenaciously certain traits are inherited, and how important it would be in contracting marriages to have the knowledge of the respective families. The works of R. ZERNER and others are of the greatest interest in this connection.

Count VON LEHNDORFF will always have the merit of having been first in his *Handbuch für Pferdezüchter* (Handbook for Horsebreeders) to illustrate by means of painstaking work and the necessary proofs the bearing of inbreeding and breeding by families in the raising of horses. He thus showed the way to be followed in applying to other kinds of animals a great part of what he had discovered in the breeding of Thoroughbred horses. The severe strain upon the constitution which is afforded by a selection of all those animals which are best adapted to the injurious effects of inbreeding. Similarly, in breeding half-blood conditions for obtaining health and a good constitution are in general favourable in horses than in other animals.

Nevertheless Herr v. OETTINGEN, who has studied further the question of inbreeding in the light of his ample experience, and also from a technical point of view, insists that close inbreeding frequently maintains evil consequences. In his book *Zucht des edlen Pferdes* (Breeding of Thoroughbred Horses) he says "unfortunately many insuccesses are recorded in the Trakehner Studbook when inbreeding closer than that of one "free generation" (1) was used. A weak, delicate constitution, light bones, and irritability have also been among the Trakehner half-bloods the consequence of inbreeding pushed too far. With a natural breed endowed with a more robust constitution, such as the Steppe breeds, close inbreeding with one or no free generation, may be practised without any bad consequences for a greater length of time than with the improved breeds. Even within the improved breeds the more robust, e. g. the Thoroughbred as said above, seem to stand close inbreeding better than most half-bloods especially those too delicately nurtured. The old experience that close inbreeding may lead at last to serious drawbacks must not be considered too lightly by modern German breeders.

Dr. DE CHAPEAUROUGE, of Blankenese near Hamburg, is a medical man who has devoted himself to the study of inbreeding and has recently taken a foremost position in the investigations on the pedigrees of domestic animals. His book on inbreeding (Rademacher, Hamburg) treats the subject exhaustively, and the whole present movement is intimately connected with his name.

GUSTAV RAV in his book *Die Not der Deutschen Pferdezucht* (The Needs of German Horse-breeding) has demonstrated how valuable inbreeding has been in the development of all our half-blood breeds. For several years past the "Deutsche Gesellschaft für Zuchtungskunde" (German

(1) Instead of the English word "remove", Count Lehndorff uses the German "freie Generation" the sense of which differs somewhat from the former.

In order to count the removes between a given animal and one of its ancestors, both on the paternal as well as on the maternal side, each generation is counted separately, including the parents of the animal in question.

On the other hand in counting the "free generations" the sire and dam are considered as one generation, and all other generations are counted together both on the sire's side and on the dam's side.

for the science of breeding) has exerted itself, together with Dr. Decaurouge, in the investigation of the nature and effects of inbreeding in the efforts to render the importance of systematic progress in this direction clearer to the breeders. The collection of pedigrees that Dr. Decaurouge already possessed has rendered possible the institution of a special archive for the investigation of ancestors and of inbreeding. Courses of instruction have been started and the Society has besides undertaken to supply pedigrees for the animals of certain breeds. In a special pamphlet the Society has proposed a uniform form and mode of entry of pedigrees so as to render them easier to read (1). These proposals have to be taken into consideration and they will doubtless lead to a more general recognition of the importance of breeding by families and by certain lines of blood.

How does the question stand at present in Germany? In horse-breeding as has been said above, Count LEHNDORFF and v. OETTINGEN are at the head of the movement and their decisive investigations have demonstrated that the prospects of success with inbreeding are most propitious with 4 free generations. When in the improved conditions of a district bred with pure-bred animals, the best are always used for breeding purposes, the result is that the most valuable races become better known and esteemed, and inbreeding gets introduced by itself. As on the other hand loose inbreeding is feared, very likely the approximately right proportion will be found by practice. This has proved true in the systematic investigation of descent in the most varied fields of breeding and holds not only for Thoroughbred horses, but also for Rhenish draught horses, as has been fully demonstrated by Dr. FRIZEN's recent work on their important lines.

In the breeding of cattle under present conditions, especially in peasant stock, a great deal of inbreeding is practised and the mischief is often unmissable. On the other hand, here also often a systematic and well calculated inbreeding is carried out, and it appears to be an excellent means of improvement. Unfortunately in the German Empire the investigation of breeding in cattle cannot be everywhere sufficiently pursued because the keeping of herdbooks is comparatively too recent. But in the districts where Shorthorns are kept and in East Friesland better conditions obtain, and for the East Prussian breeding PETERS has produced a fine opinion on the use of inbreeding and the breeding of certain lines of blood. It appears that here also, as in East Friesland and in Schleswig-Holstein, the blood of certain remarkable ancestors has a special significance and that success in breeding depends to a great extent upon the continued connection with these lines.

In the breeding of pigs, inbreeding was formerly almost generally neglected and, considering the prevailing custom of keeping them in sties, quite right to do so. Recently, however, it is sufficiently well known that to what extent breeders practice inbreeding and the systematic

(1) See No. 346, B. May 1913.

by latest times, for instance, the Neukirchen pigs, the offspring of specially strong animals, an offspring possessing unfailing good growth, high powers of meat and fine shape.

As for sheep breeding there is no doubt that in England as well Germany, much use has been made of inbreeding. Recently Dr. Schenck in part 15 of the publication of the "Deutsche Gesellschaft für Züchtkunde" (German Society for the science of breeding), contributes an investigation on the conditions of breeding in the Zemin Rambouillet, and here also it appears that most of the animals are the result of a *dedly* close breeding. If frequently the objection is raised that extensive sheep flocks have been ruined by inbreeding, the accompanying circumstances should be looked into. In a preceding paper I have shown that the time when all efforts were directed to the production of very wool, they led to a general refinement of the whole body of the sheep; is evident that the bodies thus rendered delicate were not the most suitable for inbreeding, though on inbreeding in itself this cannot be considered as an equitable verdict. (1).

Especially remarkable are the observations that refer to system inbreeding for the production of exceptionally fine sires or good dams. **BRUCE LOWE**, in his work on the breeding of racehorses, upholds the principle that excellent stallions can best be obtained when the sire is paired with a mare who possesses in her line some famous individual which is found also among the maternal ancestors of the same sire.

An instance of such a pedigree is furnished by the genealogy of "Der Adler", a Thoroughbred of the Württemberg Oriental stud at Scharnhorst (after Adlung).

Araber	Salamander	Doge	
		Sarah	Amurath
	Amadine	Padischah	
		Amourette	Amurath

... observations in his hand of native improved
 Netherland which tally perfectly with Bruce Lowe's opinion. Accord-
 ing to the method of passing a whole series of very good bears was ob-
 The pedigree of one of them, "Nero", is here given as an illu-

1. the other hand excellent dams were obtained by a composition
 strain in which the remarkable ancestor, as basis of the inbreeding,
 is not only on the mother's side but also in the paternal series
 of the sire. An instance is afforded by the pedigree of "Rube",

Nero D. L. G. Prize	2059 III. Prize	883 N. D. L. G. Ia, Ia, Ia Prize	925 Richard D. L. G. Ia, III, I Prize
		Herronin	
	Naturkraft	883 N.	925 Richard, D. L. G. Ia, III, I Prize
		Kraft	

Rube D. L. G. III Prize	3283 D. L. G. I Prize	1850	884 Richard Ia, III, I Prize.
		Riese	08 Richard Ia, III, I Prize.
	Rudhard	015	
		Rubin D. L. G. II Prize	St. 4 Richard Ia, III, I Prize

We may safely say that in Germany in all the important breeding the question of inbreeding is being most actively studied.

stead of entertaining opinions, views and prejudices, the tendency form a solid foundation of facts. These efforts have a far-reaching importance and in all cases when the herd books have allowed it they obtained valuable results. It has been found everywhere that important breeding animals always belong to families in which the lence of their blood is especially due to a few preeminent ancestors when this is recognized the real value of inbreeding and of lines of blood in its true light. Consequently no expert would think of recommending careless use of inbreeding, and the great number of insuccesses (method, even in the hands of good breeders, is not denied by any one

On the whole the present tendency is towards emphasizing selection a more rigorous picking out of favourable hereditary variations. Also who believe in the heredity of the good qualities and improve that animals acquire through being well cared for must admit that a great number of animals there are only a few that transmit with certainty to their offspring their special traits of form and of performance. It be that these qualities derive from favourable modifications of the plasm of the parents. The connoisseur's judgment for the beauty of the animal, and the tests for its performance must be increasingly applied in connection with breeding according to pedigree, in order to spread through the breeding districts the high quality of the blood of certain animals the greatest possible utilisation of inbreeding. How it happens that of animals possessing remarkable qualities only a few are capable of producing important results in consanguineous breeding and in breeding by family while others completely fail to do so, is a question that at present is shrouded in obscurity. Some light could perhaps be soonest thrown on the question by researches in sheep breeding, for the flock books give an idea of the conformation and of the build of the animal in relation to its resistance. Here I agree fully with C. LEHMAN, who, in No. 16 of the *Deutsche Landwirtschaftliche Tierzucht* of this year, regrets that Dr. SCHMEHL had not extended his investigations in this direction also. It might perhaps have been shown how often the insuccess of certain animals is due to a weak constitution and how far it may be due to other causes. Such causes might appear to be that the blood of the unsuccessful animal on which the inbreeding is based (basis of inbreeding) was not yet sufficiently fixed, or the case might be led back to the above-mentioned question, namely whether the basis of inbreeding derive from favourable variations of the germ plasm (are blastogens) or from better conditions of environment (acquired qualities). In the latter case heredity could tell less.

Be it as it may, practical breeding can hope for great results from present aims and methods.

From a biological point of view however, it would be of the greatest importance if the question of inbreeding among the various animals could be put in connection with the theory of chromosomes. Probably much more would be obtained

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Utilization of Skimmed Milk as Food for Calves. Summary of Experiments carried out on 60 Calves.

by

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One of the first subjects to which I devoted my attention on assuming directorship of the Zootechnic Institute of the Royal Agricultural College in Milan was to make investigations with the object of solving the following problem: which is the best way, for Lombardy, of utilizing skimmed milk in the feeding of calves. In this connection between 1911 and 1912 I carried out seven series of experiments on 116 calves divided into seven groups, to each of which I gave skimmed milk mixed according to a special plan, with rice-flour, maize meal, potato-starch, margarine, whole milk, oleo-margarine and potato-starch, etc.

flour, potato-starch treated with diastasoline (1) and lastly with oleo-gargarine and potato-starch treated with diastasoline or with levuline (2).

As may be seen from the reports published in Vols. VI, VII, VIII, IX and X of the *Annuario della Istituzione Agraria* Dr. Andrea Ponchi, attached to the Royal Agricultural College in Milan, the best physiological and economic results were obtained from calves fed with skim milk, oleo-margarine and starch treated with diastasoline or levuline. The calves were 60 in number, belonging to five series of experiments, four of which were carried out by the Zootechnic Institute and one in the stable of D. F. Sigurta at Comabbio (Como), always following nearly the same general rules. Here I shall, in the first place, describe these rules and conditions under which the various experiments were conducted, and then I shall summarize the physiological and economic results obtained.

The 60 calves before being subjected to the experiments were carefully examined, especially as to their health and hardiness; nevertheless soon after they became sickly a few days after being placed in the stables, but soon recovered and did not in any way disturb the course of the experiments.

Every calf was kept after its birth or purchase on the three following successive diets: 1. whole milk; 2. transition diet during which the whole milk was gradually replaced at the rate of 1 litre (nearly 1 quart) a day with skimmed milk mixed with oleo-margarine and starch treated with diastasoline or levuline; 3. economical diet, that is skimmed milk, oleo-margarine and starch treated as above. Besides, 11 calves were given small quantities of linseed cake during the last 10 or 15 days of the experiment in order to see if it were possible to force the animals to finished fattening in time. The duration of the first diet, depending chiefly upon the degree of hardiness of the calves and their weight, ranged between 1 and 33 days, and in the greatest number of cases, between 15 and 26 days. The second or transition period — at the beginning of which the weight of the calves ranged from 110 to 191 lbs., and in most of them between 121 and 136 lbs. — varied from 6 to 8 days. The third period, that of the economical feeding, lasted from 14 to 70 days, most frequently being from 1 1/2 to 2 months. The total duration of the individual experiments in the greatest number of cases was 2 months to 2 1/2 months: only in 4 cases they lasted respectively 90, 102, 103 and 106 days.

The food given was analyzed in the Laboratory of Agricultural Chemistry of the Royal Agricultural College of Milan.

The doses of oleo-margarine and of starch added to every gallon of skimmed milk in order to bring it up again nearly to what it was before

Diastasoline is a saccharifying substance that the Deutsche Diamalt-Gesellschaft extracts from malt.

Levuline is a product of the « Distillerie Italiane » Company, at Padua; it is characterized by its power of transforming starch into dextrine; its saccharifying power is used by bakers to hasten and complete the action of yeast and to obtain a fine quality of bread.

separated were determined by considering the results of chemical analysis and those obtained from calves submitted to preliminary tests. The rations were thus fixed: 4 oz. of starch and 3.2 oz. of oleo-margarine for 36 calves; 4 oz. of each for 20 calves; and respectively 4.8 oz. and 3.2 oz. for 11 calves. The quantity of linseed cake added to the other food for 11 calves was 1.76 oz. for a couple of days; this was successively raised to 6 oz. at a time up to 5.3, 7 and 10.6 oz. according as the linseed was added.

The determination of the quantity of the rations was made taking account the appetite and the daily gain in weight obtained by weighing

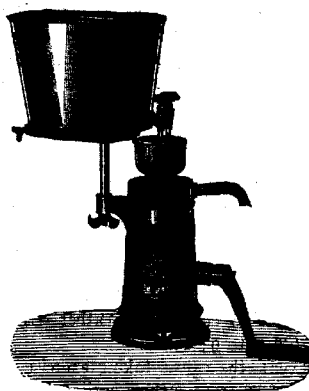


Fig. 1. — Bazzi's Emulsifier.

calves before the morning feed. The increase in weight is the safest both for the sufficiency of the ration and for detecting if there is anything wrong with the health of the animals.

The quantity of whole milk, or of skimmed milk mixed with other foods, was given daily when the animals were in good health, beginning from a week or two after birth or purchase ranged between $\frac{1}{5.1}$ and $\frac{1}{13.4}$ of the weight of animal.

In the preparation of the rations the following system was followed: the starch was mixed with an equal weight of cold skimmed milk, then boiling or nearly boiling skimmed milk was gradually added and constantly stirred, the quantity being seven times the weight of the starch. The milky-like liquid was allowed to cool to 122 to 140° F. and then dissolved in some tepid water was added to it at the rate of 30 per cent of the weight of the starch, or levuline (at the rate of 30 per

the starch) dissolved in an equal quantity of skimmed milk at the temperature of 122 to 140° F.; lastly when the mixture had become liquid was added to the rest of the skimmed milk in which the dose of oleo-marine had been emulsified by means of Bazzis' emulsifier (Fig. 1).

The rations were given in Zappa-Pirocchi's sucking-pail (Figs. 2 and 3) at a temperature of 93 to 95° F. During the first days of the first period of the experiments, i. e. during the whole-milk feeding period, the calves were given three times a day, excepting in some cases in which the whole milk was given four and six times and even more on account of intestinal troubles. In the second and third periods, with but few exceptions, feeds were given only twice a day.

The stables in which the 49 calves were kept, though not perfect from a hygienic point of view, were fairly good. They have a good aspect and are sufficiently large to counteract the ill-regulated ventilation; the temperature during the experiment ranged from 53.6° F to 64° F; the light was conveniently moderated so as to keep the calves in semi-darkness; the pavement was slightly inclined, is of cement, and the walls of the stable are lined with cement up to a height of 52 inches from the ground; the stalls are separated from each other; some are 66 by 52 inches, others 76 by 52 inches. Different are the shelters in which the remaining 11 calves were kept, 10 of them were placed in an old shed, exposed to the south, measuring 100 cub. feet, and imperfectly ventilated; it was very warm and on some days the temperature reached as high as 86° F. in the afternoon. Lastly, the remaining two calves were put together with cows and other animals in a large stable in which—owing to the unfavourable aspect of the building, defective ventilation and to changeable weather—the thermometer varied over a wide range, from 63° up to 93° F.

In order to prevent the calves taking exercise, they were tied to the stalls; and to prevent them eating the straw of their litter they were kept always muzzled except at feeding time, after which their muzzles and lips were cleaned with a cloth.

Especial care was bestowed upon the cleanness of their coats; in the morning before feeding they were groomed down and those parts that were soiled by excrements were washed and dried.

The physiological results of every series of experiments were deduced from observations carefully made with the object of determining: the influence of the various feeds upon the health of the calves; the increase of weight, total and daily, of each calf during the three diets and during the whole experiment; the quantity of food consumed by every calf in the above periods, and per pound of gain in live weight; the character of the flesh and the net yield in butcher's meat.

As for the economic results the following were calculated: the average amount of gain in live weight, for each of the three diets during the whole duration of the experiment, in comparison with the cost of each ration.

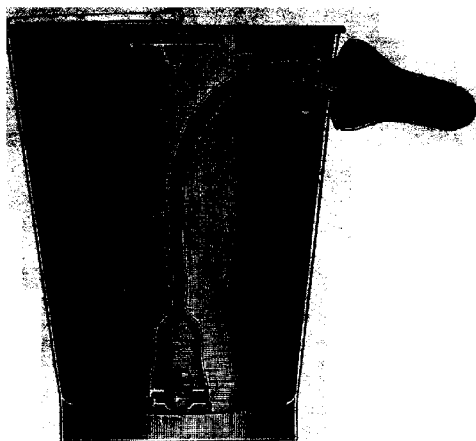


Fig. 2. — The Zappa-Pirocchi sucking pail, fully equipped.



- f) foot on which the apparatus rests;
- g) circular aperture through which the milk passes on being sucked;
- h) rubber ball which, rising and falling during suction, opens and shuts the circular aperture g;
- i) cage for rubber ball;
- j) upper part of apparatus, which screws onto the foot, while its top is connected with the rubber tube leading to the artificial teat.

Fig. 3. — Section of the valve apparatus in the Zappa-Pirocchi sucking pail.

gain in calves fed only with whole milk; the price which a gallon of milk fetches when utilized by the calves (x).

Health conditions of the calves. — During the whole-milk diet one calf died from a rather serious scour, which ceased after a few days by treatment with small rations of milk mixed with lime-water and laudanum; another calf fell ill of pleuro-pneumonia and soon recovered, but traces of disease were found when the animal was slaughtered. During the transition period only one calf — among those which were fed on skimmed milk and with oleo-margarine and starch treated with levuline — had some enteric trouble accompanied by scouring and loss of weight; consequently the calf was fed again upon whole milk in small and frequent doses (one or four a day), but after about a week was again submitted to a transition diet and afterwards to the economical ration without any inconvenience. During the third diet, health conditions were good, except for two calves — among those that were fed skimmed milk with oleo-margarine and starch treated with diastasoline — one of which was seized with pneumonia after one month from the beginning of the economical diet and had to be sold immediately; the other two suffered slight and brief intestinal troubles with excretion of soft and acid-smelling faeces in one case, whitish hard and foetid faeces in the other. It is also to be mentioned that 10 calves — 8 of which were subjected to the skimmed milk, margarine and starch treated with diastasoline diet, and 2 to the skimmed milk, margarine and starch treated with levuline diet — showed themselves poor feeders, leaving portions of the morning or of the evening feed; it was ascertained that in 5 of these calves the fact of their leaving part of their ration of whole milk — was not due to any health trouble or to the quality of the food, but only to habitual lack of appetite; whilst for the other 5, refusal to finish their food was due to the linseed cake which gave an unpleasant odour to the rest of the food and for this reason its use was discontinued.

Increase of weight. — The following figures show the average daily gain in weight.

In the first period, whole milk.	1.54 lb.
• second period, transition feed.	2.17 "
• third period, skimmed milk mixed with oleo-margarine and starch treated with diastasoline or levuline	2.00 "
• whole experiment	1.91 "

The small gain obtained in the first period, during which the calves were fed whole milk, is due to the fact that many cattle men have the deplor-

) For the method adopted in these calculations see my reports on skin feeding of calves, in Vols. VI, VII, VIII, IX and X of the *Annuario Agrario* Dr. Andrea Ponti, published by the Royal Agricultural C

able habit of giving the calves as much milk as they can swallow on the morning of the sale, in order to make them weigh more; the result is that to serious gastro-enteric troubles they must be kept on short rations for a few days, giving them only small quantities of milk. This causes a slack in the live weight gain and sometimes even a loss during the five or six days following the sale; this diminution is only partly compensated by successive normal increase. This is the chief reason for which the average increase observed during the first period cannot be compared with the increase made during the other periods so as to form an idea of the respective advantage of the whole milk and of the skimmed milk, oleo-margarine and starch feeds. In order to determine this, another comparison can now be made. In carrying out the first series of experiments 4 calves were fattened on whole milk, — keeping them in the same conditions of stable grooming, etc. as 49 calves out of the 60 experimented upon — in order to demonstrate that there was only a slight, if any, economic advantage of the method of feeding. On comparing the average gain obtained in the first period between the birth or purchase and the sale of the 4 calves (1.87 lb.) with the gain obtained in the 2nd and 3rd periods and during the whole experiment (2.17, 2.00, 1.91 lb.), it will be seen that the gains in weight of the calves fed according to the method set forth in this report were considerably superior to those made by the calves fed on whole milk. To this assertion, however, no excessive weight must be given, because there are some cases that present still higher gains from whole milk feeds, but such is not the general rule, while many are the calves that on whole milk diet are about the same gains as those fed prevalingly on skimmed milk. The addition of oleo-margarine and starch treated with diastase or levuline.

Food consumed. — The average quantities of whole or skimmed milk consumed by the calves for every pound of live weight gained are shown in the following table.

In the 1st period:	whole milk,	8.610 lbs.
2nd	whole milk.	3.879 "
	skimmed milk	3.950 "
3rd	" "	10.341 "
During the whole	whole milk.	2.029 "
experiment:	skimmed milk	7.660 "

If these figures be compared with those giving the quantity of whole milk that is considered necessary to obtain 1 lb. of gain during the first six months of the calf's life (from 10 to 12 lbs.) the following interesting fact is observed: that the average quantities of whole and skimmed milk consumed by the calves during the 2nd period and during the whole experiment are such that the skimmed milk consumed during the 3rd period have been found to be even inferior, to the quantity of whole milk required for the same amount of 1 pound.

Character of the meat. — With the exception of one cow-calf of the Simmental breed — which, for its handsome appearance, was bought, at the age of 103 days, when it weighed 297 lbs., for breeding purposes by the agents of the Hon. Senator Marquis Ettore Ponti's estate — all the calves were sent to the butcher and of each of them the quality of the meat was observed.

According to the above observations the 59 calves can be divided into two groups. To the first belong 43 whose quarters in general had a fine appearance, with white firm close-grained flesh; the second is composed of the remaining 16 calves, whose flesh was reddish and more or less

As for the fat it was white, of proper firmness and abundant under the skin and about the kidneys, in 37 calves; in the remaining 22 it was white and not so plentiful, especially about the region of the kidneys which was only partly covered by fat.

The judgment pronounced on the meat, which was cooked in various ways, was, with the exception of a few carcasses, that it was good and sometimes excellent.

It is to be mentioned that as for the quality of the meat several calves on skimmed milk with adjuncts were in no wise inferior to those fed on whole milk; this also was the opinion of the butcher, who declared himself pleased with his purchases.

Carcass weight. — The net carcass weight at the slaughter house — stated according to the custom of the trade at Milan, by weighing the animals diminished only by the weight of the blood, stomachs and intestines — averaged 76.03 per cent. it ranged from 67.29 to 84.64 per cent. of the live weight.

Cost of the gain of 1 pound live weight; — The following are the costs per pound of gain in live weight:

In the 1st period: whole milk	5.66 d
" 2nd " transition	4.02 "
" 3rd " skimmed milk with adjuncts	3.89 "
During the whole test	4.19 "

A simple inspection of these figures shows the considerable difference between the cost of 1 pound of gain in calves fed on whole milk and that of those fed on skimmed milk with adjuncts. But here also it must be stated that the figures of the first period cannot be rigorously compared with those of the other periods also for the reasons previously given. Anyhow it is admitted, as is generally believed, that during the first two thirds of the life of a calf an average of 10 lbs. of whole milk is required for 1 lb. of gain, and if the milk be valued at the average price of 6.67 d. per gallon, which was current during the time the experiments lasted, it results that by feeding whole milk from birth to the time of selling the calf the average cost of one pound of live weight would be about 6.56 d., somewhat higher than the average 4.19 d. calculated for the 60 days on the basis of prices which for the various foods given are anything

low: oleo margarine, £2 12s 6d to £2 16s 6d per cwt.; starch, 14s 18s 6d per cwt.; diastasoline, £2 16s 6d to £3 0s 6d per cwt.; levulose, £2 0s 6d to £2 8s 6d per cwt.

Prices realized for the skimmed milk through the calves. — This milk averaged 4.97 d per gallon. But it must be mentioned that in determining the cost of the other foods consumed by the greatest numbers of calves it was calculated at rather high prices and that several of the best calves had to be sold at an unfavourable moment when the prices were low. In some cases, however, the prices realized for the skimmed milk were considerably above the average, reaching as much as 6.45 d, 6.76 d and 7.56 d per gallon. These prices are in part due to the fact that in general the calves were sold at rather high prices; though it is also true that the purchase prices of the calves were higher than usual, as well as the prices of the foods used.

On the basis of the above physiological and economic results it is concluded:

1. — *That skimmed milk mixed with oleo-margarine and starch or with diastasoline or with levulose may be advantageously employed as food for calves destined for the butcher, according to the methods set forth in this report.*

2. — *That for the so-called reintegration of every gallon of skimmed milk the following quantities may be recommended: 3.2 oz. to 4 oz. of oleo-margarine and 4 oz. of starch; and 1.6 oz. of diastasoline or 4.8 oz. of levulose for the treatment of 1 lb. of starch.*

Wheats from the British Millers' Point of View

by

A. E. HUMPHRIES,

*President 1906-07 National Association British and Irish Millers,
Chairman of its Home Grown Wheat Committee*

Within the last 30 years, the British flour milling industry has been subjected to revolutionary development in two principal directions, economic, the other technological. At the beginning of that period there were 10 000 mills in the United Kingdom producing flour; to-day the number is less than 1 000, although the quantity of wheat ground per annum is now 80 per cent. greater than it was 30 years ago. Furthermore, one third of the flour produced in the United Kingdom is made in about 30 large mills situated at seaports.

Among the following facts are associated with these developments. The acreage under wheat in the United Kingdom has been diminished, so that although the yield per acre has been increased, the quantity of home-grown wheat, which 30 years ago was 50 per cent., is now only about 20 per cent. of our requirements.

b) The standards of excellence in flour have been raised, whereas average quality of our home-grown wheat has been lowered. .

c) The milling system of gradual reduction by means of roller mills entirely superseded the use of millstones. The mills now existing are equipped.

d) The development of new countries and the insufficiency of labour in wheat-growing areas, have caused wheats to contain a substantial portion of dirt, seeds and other extraneous matter, so that elaborate and costly installations of wheat cleaning machinery have been rendered necessary in our mills.

e) A system of "conditioning" has been elaborated whereby as a result of the skilful use of water, great improvements in the quality of flour and great changes in the relative values of wheats have been made.

f) Under pressure of extreme competition, millers have to work on very small margins of profit per unit, and cannot afford to make mistakes in milling or tolerate irregularities in the quality of their manufactured goods.

The very small modern mill cannot secure optimum technical results, and developments in technology were predisposing causes of its commercial extinction or of its enlargement. A miller who first adopts sound principles in milling practice, incurs substantial risks, but secures adequate results, so in the early days of roller milling, many inland mills were increased in size and yielded adequate profits, but when their competitors adopted the same novelties, the economic unsoundness of their position became apparent. Unfortunately, the necessities of our railway companies greatly accentuated the difficulties of our inland millers. Our railway service is in some respects a very good one, but its rates for freight are high, so that an inland mill which had to depend for its supply of raw material and the distribution of its products upon railway transport could not compete with a mill, which, taking advantage of our relatively great inland waterways, could avoid the use of railways in obtaining the wheat it required, in distributing the whole or a large proportion of its products. The whole story concerning the decadence of our small country mills would be too long for this article, but this summary indicates the great determining influence of the economic revolution in our industry, whereby many inland mills have had to close their mills and go out of business, or migrate to the coast, or restrict the size of their operations, so that they could obtain raw material and distribute their products at a relatively low cost for transport charges.

This excursus upon economics is justified, because it will serve to point out the reason for an apparent contradiction in these two statements, that the British miller is willing to buy practically any wheat offered him; the other that the National Association of British and Foreign Millers has spent much time, through the instrumentality of its Wheat Committee, in efforts to improve the quality, particularly the strength, of our home-grown wheats, whereby the highest degree suitable for the commercial requirements

district in which they are grown. If they be not improved, the miller in the district will still be compelled to buy suitable foreign wheat, and a large proportion of the native wheat produced in our wheat-growing districts will still be transported at great expense either as wheat or flour to other districts. The railways will still gain by earning haulage charges in both directions, but the grower, miller, and consumer will have to bear the burden between them of the expenditure, which is to be unnecessary. The Committee already knows that wheats of the best quality can be produced in an ordinary season in this country, and its efforts are directed principally to obtaining new varieties of prime quality and high yielding capacity. When within a few years that object has been achieved on a large scale, port millers will doubtless seek to buy foreign wheats than they do now, but the same economic causes which have helped them so greatly in the past, will favour the inland miller then, and it is in all probability a prosperous future before these inland firms, who are able to obtain their raw material locally and sell their products in the same district. The position of a firm well equipped with brains, management, and knowledge, operating on such lines, should be commercially im-
mense.

The greater part of the flour consumed in the United Kingdom is used for bread making, but some is used for the making of cakes, pastry and puddings, some for biscuits, some in other industries. In some parts of the country bread is made at home by housewives or their household servants, but in the greater part of this country, bread is made by professional bakers, who handle large quantities of dough daily. Ordinarily bread is made by means of panary fermentation; sometimes, for instance in some parts of Ireland, the aerating gas is produced by means of a chemical reaction between an acid and an alkaline body, such as sour milk or phosphates and carbonate of soda. For biscuit or pudding making flour made from existing typical ordinary English wheat, harvested in good condition, is satisfactory, but the flour from such wheat is not sufficiently stable in the dough, or sufficiently "strong" to make satisfactory bread. Farmers and the great majority of inland millers would be better recompensed if we produced at home wheats from which bread-making flours can be produced, even if we had to import a small proportion of wheats from which good pudding and biscuit flours can be made. The point I specially wish to make at this juncture is that wheats of widely differing characteristics are required by British and Irish millers.

My next point is, that market value is not a true index of intrinsic worth. No person, or Government Department, has set up in this country a standard whereby the intrinsic worth of a wheat or flour is judged, nor is any such action desirable, but certain characteristics of wheat are highly esteemed, and the trades concerned have come to regard the possession of certain qualities as a measure of intrinsic value, and because such wheats are generally in relatively small quantities, they usually realise maximum prices. A considerable amount of the

be used in milling, but the millstone applied an unnecessary amount of pressure in an unnecessarily severe way. The public demands a white, light coloured bread, and in these days of good wheat cleaning apparatus, the principal cause of dark bread is the presence in low grade wheats of an appreciable amount of bran powder. A wheat which is hard and has a friable skin is more likely to be comminuted than a mellow one; bran powder from a "red" or brown wheat will darken the bread much more than the same percentage of bran powder from a "white" or yellow wheat. So 40 years ago, in millstone days, a wheat which was mellow, soft, and strong was considered excellent. Hence the high repute in Dantzic, among foreign wheats, and Chidham, among native varieties, were held in those days. But with the advent of roller milling and roller flours made from wheats grown on the virgin lands of the United States and Canada, the older standards as to excellence of quality were discarded, and we gradually came to recognise as specimens of high intrinsic value the better grades of Canadian and United States spring wheats, the friable "red" skinned varieties, containing, a high percentage of protein. Such wheats have for many years realised ordinarily the highest prices of our markets, but not invariably. For we want types of wheat as well, and supply and demand are far more influential elements in price making than any current ideas as to intrinsic

value. The upshot of these considerations is, that British millers do not impose any conditions as to the type or characteristics of the wheat offered them. All sorts and conditions of well-harvested wheat find a value on our markets, and can be sold therein. We do, however, attach great importance to various points of excellence, and believe that no wheat breeder can in most, if not in all countries, provide varieties of the highest degree suitable to the "environments" existing there, and the commercial requirements of millers. British millers are to a greater extent than ever running their mills in a scientific way; some have scientists on their staff. The idea that wheat is sacrosanct is going away; the newer conception is, that it is a fruit of the earth created by Nature to be a seed and that in making it fit for use as human food the miller is right in obtaining not the only aid of the engineer, but the aid of the chemist as well. With such aids he is the more disposed to make his arrangements subservient to the interests of growers. But he asks that the arrangements made for marketing should in all countries be suitable. For instance if "grading" be established in any country, the methods adopted should be uniform throughout the area concerned, and provision should be made for rectifying any substantial errors which arise in practice. He also asks that the glaring malpractices existing in connection with Russian grain shipments should cease. Such as they are, in the long run be highly unprofitable to the perpetrator. Nevertheless, we can take effective means of resenting them. Nevertheless, the history of the grain trade has shown, it would be better for all parties that such evils should be rectified by the joint action of all

merchants and receivers, with or without the co-operation of the Governments concerned.

The following points should be remembered by those wishing to improve wheats on our markets:

1) Bults should be uniform throughout, and the standard of quality whatever it may be, should be maintained with a minimum deviation herefrom.

2) Wheats which contain the smallest percentage of dirt, mud and other extraneous matter and which yield the highest percentage of flour with the minimum of risk and trouble to the miller, are those which we prefer. Their virtues have a cash value.

3) Nothing should be done to hide or disguise any imperfections or faults of quality. A miller is more likely to buy wheat of poor quality at a reasonable price than run unknown risks by continuing to buy, even at a very low price, wheat whose real qualities he is unable to recognize and appraise.

4) Ordinarily the colour of the bran is relatively unimportant, but preference should be given to white wheat. In this connection, it should be remembered that white wheats can possess great strength, and that dark skinned wheat can yield a white high grade flour. Quality of endosperm is one Mendelian character and colour of skin is another. There is no inevitable correlation between the two.

5) If on all other points they are of equal merit, wheats yielding a heavy flour are superior to those yielding a yellow or dark one.

6) A clear distinction should be drawn between wheats which are hard, merely because the percentage of moisture they contain is low, and those which are really hard by nature, even when their moisture is raised to that of dry English wheat, say to 16 per cent.

7) Wheats, whether inherently hard or mellow, should always be of a "free milling" nature; in other words, it should be possible to obtain flour with the minimum of trouble and power the desired separation of the bran from kernel. A mellow wheat which becomes "woolly" or a hard wheat which becomes "horny" when water is added before or during grinding cannot be an ideal wheat.

8) The berry should be of average size, neither too short nor too long, neither too big nor too small.

9) Although bults should contain no stones, dirt, seeds or other extraneous matter, a low percentage of such impurities is not a great objection so long as their size and specific gravity differ substantially from that of wheat. Special care should be taken to exclude aromatic impurities such as eucalyptus.

10) If the wheat come from a country where it is likely to suffer from the depredations of weevils, it should be of a kind which they do not readily attack, or it should be stored under conditions in which the risk of such damage can be minimised, or it should be exported soon after harvest. If wheat come from a country where it is likely to suffer from

is of rain or humidity at harvest time, those varieties should not be sown which are likely to sprout easily.

(2) Durum wheats are not likely to realize maximum prices in our markets for flour purposes. The objections against them are much less than they used to be, but in spite of all improvements in our methods of milling them, they are not so suitable for flour making as wheats of the "hard" type. Some varieties of Durum are much superior to others, and for agricultural reasons it is desirable to grow this type of wheat, but varieties of it should be tested by growers, and those selected for sowing cultivation which suit the producer and are least objectionable to the miller.

(3) Wheats which require different methods of cleaning and conditioning as part of the milling process, should neither be grown together nor mixed together before that stage of preparation has been passed. If that recommendation be not observed, the miller cannot develop or utilize to the greatest advantage the potentialities of the wheats so mixed, and cannot expect to pay maximum prices for them. Therefore, an inherently soft wheat should not be mixed for sale with a naturally mellow one, if the best commercial returns are to be obtained by the producer. For such cases it is important to discover in very hot countries, to what extent irregularities in the texture of wheat are due to irregularities in water supply, how by a proper regulation of water in irrigation, or by a proper preparation of soil the supply of moisture to the wheat plant can be made adequate at the right times. Furthermore, as white bran is not infrequently found more than red, it is undesirable to grow together or mix before shipping white and red wheats.

(4) Nondescript wheats are not of high value. If a wheat be really good and poor in other respects, or if it yield flour of particularly good colour or flavour and on other points be of poor quality, its one great merit recommends it to buyers, whereas wheats of no outstanding merit on any point are merely "padding" and have no particular value. They can be sold but at a low price.

SECOND PART.
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

898 - Regulations governing the Preparation, Sale, Barter, Exchange, Shipping and Importation of Viruses, Serums, Toxins, and Analogous Products intended for Use in the Treatment of Domestic Animals. - *United States Department of Agriculture, Bureau of Animal Industry.* B. A. I. Order 196.

Under authority of the Act of Congress approved March 4, 1904, entitled: An Act making appropriations for the Department of Agriculture for the fiscal year ending June thirtieth, 1904 (37 stat., 832), the following regulations have been made; they are designated as B. A. I. Order 196 and have become effective on July 1, 1913.

No person, firm or corporation shall prepare, sell, barter or exchange or deliver in the district of Columbia or in any territory of the United States or in any place under the jurisdiction of the United States any virus, serum, toxin or analogous product (antitoxins, vaccines, bacilli, culins, malleins, microorganisms, killed microorganisms and products of microorganisms) manufactured within the United States unless it has been prepared at an establishment holding an unsuspended and unrevoked licence issued by the Secretary of Agriculture.

A licence will be issued only after an inspection of the establishment by a duly authorised officer or employee of the Bureau of Animal Industry, has shown that the condition and equipment of the establishment and the methods of preparation are in conformity with these regulations. Each licence shall terminate at the end of the calendar year during which it is issued, and it shall be reissued only after a new inspection. A licence shall be suspended or revoked if it appears that the construction or equipment of the establishment is defective, if the methods of preparation are faulty; if the products are advertised or labelled so as to mislead the purchaser in any particular; if the licence is used to the preparation, sale etc., of any worthless or harmful product; if the licence violates or fails to comply with any provision of the Act.

ch 4, 1913 or of the regulations made thereunder. The preparation of virus, serum, toxin or analogous product will not be allowed if put up in such a way as to mislead or deceive any one as to their nature. Every separate container of the above substances shall bear the name of the product and the licence number assigned by the department as well as a serial number affixed by the licensee for the identification of the product, with the records of its preparation. Each container also bear the "return date".

The importation of the above products will be allowed only to those persons who have obtained a permit from the Bureau of Animal Industry. The importer of virus, toxin or analogous product shall make application to the Secretary of Agriculture for a permit, such application to be accompanied by the affidavit of the actual manufacturer prepared before an American consular officer stating that the product named is not worthless, contaminated, dangerous or harmful, and if derived from animals, that such animals have not been exposed to infectious or contagious disease, except as may be essential in the production of the product and as specified in the affidavit.

Each application for a permit shall be accompanied by the written consent of the actual manufacturer that properly accredited officers and agents of the Department of Agriculture shall have the privilege of inspection without previous notification all parts of the establishment at which such products are prepared,

each permit shall terminate at the end of the calendar year during which it is issued.

Persons duly authorized by the Department of Agriculture to visit establishments in which viruses and such products are prepared, shall be permitted to inspect the entire premises and all the equipment, including chemicals, instruments, apparatus, etc. as well as the methods used in the preparation, handling and distribution of the said products.

Machinery, molds, instruments, tables or other apparatus which come in contact with virulent or attenuated microorganisms or toxins shall be used in the preparation of other forms of biological products.

All equipment, containers, machinery used in the preparation of such products, etc. shall be thoroughly sterilized before use.

Each licensed establishment shall keep permanent detailed records of the methods of preparation, of the sources of bacterial cultures, of the location of such cultures, of the methods of testing purity and potency of the product, together with the methods of preservation.

The stables used for experiment animals shall be in good sanitary condition. Animals infected with, or exposed to disease shall be properly isolated, and all instruments, containers and other apparatus shall be thoroughly cleaned and sterilized before use. Establishments shall be so arranged as to avoid the spread of disease, and suitable arrangements shall be made for the disposal of all refuse.

Viruses, toxins and analogous products shall be stored in cool places or refrigerators both by the manufacturers and by the dealers.

The immunity unit for measuring the strength of tetanus antitoxin shall be 10 times the least quantity of antitetanic serum necessary to save the life of a 350 gram guinea pig for 96 hours against the official dose furnished by the Hygienic Laboratory of the United States Health Service.

The number of immunity units recommended for the prevention of tetanus in a horse shall be at least 500 units.

899 - Decrees Establishing Experimental Stations for the Investigation of *Manihot* and *Hancornia speciosa* in the States of Bahia, Piauí, and Minas Geraes, Brazil. — *Diário Oficial, Estados Unidos do Brasil*, Year LII, pp. 3553-3565. Rio de Janeiro, March 9 1913.

By the decrees Nos. 10053, 10054 and 10055 of February 14, 1913, experimental stations are to be established in the states of Bahia, Piauí, and Minas Geraes respectively for the culture of *Manihot* and *Hancornia speciosa*. The purpose of the stations is the experimental investigation of all the factors related to the culture of the principal species of *Manihot* (*Glaziovii*, *dichotoma*, *heptaphylla*, *Piauhyensis*) and of the principal varieties of *Hancornia speciosa*, in order to determine which are best adapted to the various soils and to provide information and complete data to agriculturists and others interested in the subject as to the necessary methods and processes to be adopted for the production of rubber in those regions on the most up-to-date and economical lines. Further, investigations will be undertaken with regard to food plants and stock breeding which will prove useful adjuncts to the plantations.

900 - Grants for the Development of Agricultural Education in the Argentine. — *Boletín oficial de la República Argentina*, Year, XXI, No. 5789, pp. 911-912. Buenos Aires, April 21, 1912.

The presidential decrees of March 28th, 29th, and 31st, 1913, authorized the following expenditure:

For the founding and carrying on of the « Escuela de Agricultura de 25 Mayo »	24
For the founding and carrying on of the « Escuela de Mecánica agrícola » at Bahía Blanca	19
For the founding and carrying on of the « Escuela de Agricultura » of the Tigre	48
For building and working a model workshop at the Tucumán school	16
For purchase of laboratory material for the above schools	30
For erecting buildings for agricultural schools	48

- Agriculture in Russia. — HETTER, M. H. in *Société Centrale d'Agriculture et de Commerce de la Seine-Inférieure*, Year 153, New Series, No. 21, pp. 62-93. Rouen, 1912. European Russia forms an extensive plain, which at no point from the Black Sea to the White Sea or from the Carpathians to the Urals, all but 300 m. (1000 ft.) above sea-level. Its climate is marked by great differences of temperature and is characterized by great differences of temperature between summer and winter, a rapid transition from the hot to the cold season.

the vegetative period is unusually short, so that, in spring especially, the labour available for preparing the fields are scarcely sufficient, the annual rainfall (St. Petersburg 504 mm. 19.8 ins), Moscow and Riga 411 mm. 16.2 ins, Warsaw 561 mm. (22.1 ins.) is adequate on the whole, but very irregularly distributed among the different periods of the year. The present scarcity of food in Russia is due, not to absolute want of rain, but to its deficiency at the times when the crops are just coming up, namely in June and September for winter crops and April and May for spring crops.

With regard to the various types of soil and their cultivation, four different regions can be distinguished in Russia passing from north to south: the forest region, the black soil region and the dry steppe. In the tundra zone, which occupies the northern halves of the Government of Archangel and of Finland, lichens and mosses predominate and in sheltered spots are occasional willows, spruces and dwarf birches to be found.

In the forest region extending southwards to the middle of the Government of Kazan, Nizhnii Novgorod, Ryazan, Tula, Orel, Kiev and Podolia, the growing season lasts for 8 or 9 months. In this zone, which was formerly completely wooded, the burning-off system is practised in many places. This system of cultivation is, however, gradually disappearing, and particularly in the south of this region is being increasingly replaced by the three-field system, and even by a six or eight year rotation with seed-leys (clover leys). Here with the exception of the sugar-beet district, agricultural stock-breeding and agricultural industries are the furthest advanced. In addition to large quantities of farmyard manure, chemical fertilisers are increasingly used. Flax is the chief crop grown.

In the black soil region throughout its whole southern extent is the black soil region which occupies between 250 000 and 280 000 sq. miles. The cold and warm seasons of the year are here of about equal length. The three-field system is exclusively practised. The rich soil is never exhausted at all events on peasant properties, and in many districts, especially in the south, cereals are grown year after year. While only 40 per cent. of the forest region is arable land, the latter occupies 70 or 80 per cent. of the black soil area, owing to the extensive cereal cultivation.

In the south, this productive zone passes gradually into the dry steppe region, and into the zone of the nomads and herdsmen, which further extends to the salt steppes of the Caspian Sea.

After the freeing of the serfs in Russia in 1861 the curious form of collective ownership obtaining in the peasant communities (Mir) hindered agricultural progress. Since 1906 the Agrarian Commission has been engaged in converting the collective property of the communes into the private property of the peasants (1).

For the reorganisation of agricultural land tenure in Russia, see No. 1.

1174 DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES

The total area of European Russia (exclusive of Poland and the occupied by lakes and rivers) is 1 944 726 sq. miles which in 1911 divided as follows :

	acres
Forest	408 584 576
Cultivated land	497 545 319
Wheat	61 210 990
Barley	26 451 477
Oats	39 953 067
Rye	63 416 065
Maize	3 638 348
Millet	7 496 683
Potatoes	8 243 382
Buckwheat	4 933 391
Flax	3 566 642
Hemp	1 801 893
Natural meadows and pastures	66 327 847

Hitherto, rye has taken the first place among the cereals. For the ten years, however, its cultivation has not extended, but has rather a tendency to decrease. In 1910, 674 508 tons were exported, value £ 3 200 000.

The area under wheat increased from 47 000 000 acres in 1906 to 62 000 000 acres in 1911. Russia is now the chief wheat-exporting country in the world; her exports were 5 128 764 tons in 1909 and 6 178 700 in 1910, while in 1910, the United States exported 2 760 000 tons, Argentina 1 970 000 tons, Canada 1 400 000 tons, British India 1 200 000 and Rumania 1 900 000 tons.

The area under barley has steadily increased during the last 10 years in 1910 about 4 000 000 tons were exported.

The total exports of wheat, rye, barley and oats in 1910 amounted to 129 824 000 tons with a value of £ 70 099 016.

Russia is without doubt the chief flax producing country. The area and yields for this crop were :

	Area in acres			Total yield in tons 1911	Yield cwt. a.
	1912	1911			
In European Russia	3 467 295	3 428 694	Seed	513 592	3.1
			Fibre	461 424	2.8
Asiatic Russia	227 770	279 544	Seed	22 168	1.6
			Fibre	21 700	1.6

The amount of flax exported shows a tendency to decrease and is due partly to the increased demand for the raw product in the home market and partly to the fact that sugar beet is taking the place of flax. Russia possessed 1 648 216 acres of sugar beet fields and these increased to 1 944 746 acres in 1911, while its sugar production amounted to 1 993 990 tons. On many estates from 8 to 8.7 tons of

duced per acre, but the crops, especially on the peasant properties be greatly increased by the more liberal use of chemical fertilizers. In July 1, 1912 the numbers of live stock in European Russia were as follows:

Horses	23 860 178
Cattle	34 547 348
Sheep and goats	42 735 567
Pigs	11 944 568

The number of animals exported from Russia is relatively inconsiderable, but the export of animal products is assuming ever-increasing importance.

In 1898, 10 120 tons of butter worth £688 064 were exported while 7, 56 758 tons were exported, valued at £4 933 400. Most of the export goes to Great Britain, Germany and Denmark. Russia exports poultry (especially live and dead geese) to the value of about 1,000 and in 1910, nearly three thousand millions of eggs, worth 1,800 were exported.

In spite of the great progress which agriculture has already made in Russia, and which is not manifested so much by increased crops per unit area as by the extension of the cultivated area, it has not yet reached the limit of the natural resources of the country. But the gradual adoption of better and more intensive methods of cultivation, the growing use of chemical fertilizers, the development of the home agricultural machine industry together with increased imports of foreign implements and especially the important reorganisation of agricultural land tenure, indicate that the production per unit area will shortly be raised.

The Agricultural District of Groningen, Holland. — VERRIJN STUART, C. A. *Landwirtschaftliche Jahrbücher*, Vol. 45, Part 3, pp. 519-528. Berlin, May 3, 1913. A review of the historical development of agriculture (cereal and beet cultivation), of moor cultivation (peat-cutting and potato-growing), and of the industries connected with agriculture (the manufacture of meal and cardboard made from straw) in the Groningen district.

The Eradication of Mosquitoes by the Cultivation of Bats. — *Communication to the International Institute of Agriculture* by Dr. CHAS. A. R. CAMPBELL, San Antonio, Texas.

The writer begins by a brief review of the discoveries made concerning the transmission of malarial fever, he then describes how the mosquitoes take their living poison into its human host, and communicates the results of an enquiry made by him by means of hundreds of letters addressed to health officers and druggists in different parts of the Union, in order to ascertain the existence of malaria in the several States. He quotes Dr. L. O. Howard, Chief Entomologist of the United States Department of Agriculture who very conservatively estimates the cost of malaria at one hundred million dollars. He states that the greatest enemy of the mosquito, according to the writer, is the bat. For the cultivation and propagation of this animal the writer describes a kind of wooden tower or roost (see fig. 2) which offers

vantage of preventing bats, who are obliged usually to fly long distances from their caves in search of food, remaining continuously on the wing for ten and twelve hours at a time, from continually seeking new quarters.

Besides the well known means of defence which the bat possesses against its enemies viz its nocturnal habits, its propensity for hiding in dark places during the day, its facility of compressing its body into small apertures, there is the character of the hair covering its body. This feature is considered by the writer to be a protection against the bites of the Anopheles which during the day also inhabit the same dark places. This protection appears to be due to the peculiar formation of the hair which is not a round and smooth shaft, but is similar in form to a number of Morning-glory flowers strung on a straw, with the edges of the flowers terminating in points with the bells outward. Possibly the odour of the bat also serves to protect it from mosquitoes. That bats are most remarkably free from disease is evidenced by the fact that they live in colonies by the million, hang touching one another, and even to one another in huge bunches, yet people engaged in the business of gathering guano from caves very rarely find a dead bat.

That mosquitoes form the chief diet of bats is certain, ninety per cent being a conservative estimate. The character and arrangement of its teeth clearly show it to be carnivorous. It will eat pieces out of hams and bacon left in smoke houses. The character of the bites show the piece to have been torn out, instead of being gnawed, as would be the case, if gnawed by some rodent. The mosquito being a blood-sucking insect furnishes the bat with an ideal carnivorous diet.

Knowing of a hunter's small cabin some ten miles from San Antonio where bats were congregating, I procured two large white sheets and spread them on the floor of the cabin about four o'clock in the morning and awaited their coming. I had however stuffed the roosting places of the hut with rags so they could not roost out of range of the area of the sheets. I watched carefully and counted the proper number going and verified the count from the inside of the cabin. I then left the cabin and returned in the evening to count them again when they flew out. After counting the same number going out as came in, I very carefully collected the pieces of guano on the sheets, put them in a little box, and again spread out the sheets to continue the experiment the next day. This was done three times consecutively, and the result is that it averaged twenty-six (26) pieces of guano to each bat. These observations were made in the month of November, purposely selected on account of the food of the bats being about at a minimum at this time.

Having ascertained approximately how many times a day a bat drops guano I took one dropping or single piece of guano and macerated it in a solution of peroxide of hydrogen for several days. The peroxide dissolves the organic and concreted mucus which holds the mass of guano together. I filtered this through ordinary filter paper the weight of which was previously ascertained, and found the residuum to contain principally the minute skeletons of mosquitoes; the proboscis, the heads, and

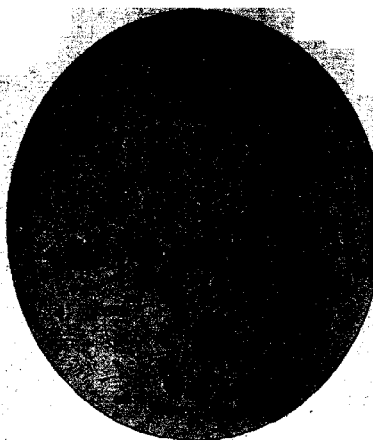


Fig. 1. — Bat Guano; Showing Skeletal Remains
of Insects, principally Mosquitoes.

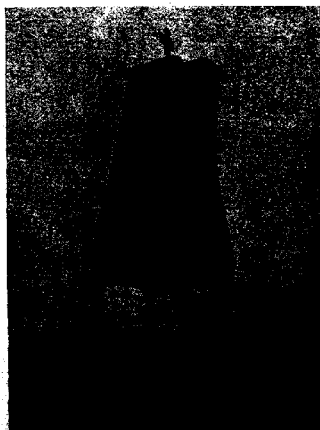


Fig. 2. — Dr. Campbell's Hygostatic Guano - Producing
Bat Roost.

the abdomens, legs, wings and scales of mosquitoes (See fig. 1). The entire body or shell of mosquitoes being of a horrid substance as chitin, affords the bat no nutrition being entirely insoluble, passes through the alimentary canal as fecal debris. The contents of the head and in fact all internal organs are digested. The weight of the entire residue of one bat dropping, was approximately $1/25$ of a lb.

It is much of the work is purely scientific, but it demonstrates the value of these usually despised creatures. I was content with doing this much, and would have considered the work concluded, had it not occurred to me, to weigh the twenty-six pieces of guano. Twenty-six pieces of guano toward the end of the season, when insect matter is at a minimum, weigh two and three-fifths grains; the bat in its active season is active from about Feb. 16 to as late as Dec. 15, depending on the season.

In order to be very conservative in estimating the value of the guano, I will calculate only on eight months, namely from the middle of October to the middle of December.

Commercial value of one bat roost at estimated capacity of 500,000 bats. Twenty-six pieces of guano, which are the droppings of one bat per month, weigh two and three-fifths ($2\frac{3}{5}$) grains, which equals seventy-eight grains per month, or, six hundred and twenty-four (624) grains in eight months. 500,000 bats drop in the same time 624 times = 312,000,000 grains, or more than 20 $1/4$ tons; at 30.00 dollars per ton, equals \$607.50. A structure large enough to hold 500,000 bats would cost, figuring long, about \$1200; now let us treat this estimate just as a minimum, deduct 50 %; I think we could well afford to deduct 50 % again from that, and still leave a nice margin of income, on the investment.

At the beginning of this writing, it suggested that the bat ought to be housed with a home, in order that we might take advantage of its habits, and the photograph shown and marked "Dr. Campbell's Guano-Producing Bat Roost" represents such a structure in existence — though intended only as a working model for demonstration — has proved itself more than a model. The Roost stands ten feet above the ground, and the structure itself, twenty-feet above that, is six feet at the base, and six at the apex. It is given that steeply and placed above ground for several reasons: Its shape makes it difficult for high winds and the elevation from the ground acts as a wind break and allows the supporting posts to be fitted with contrivances to prevent the bat's enemies, from gaining access to the Roost, also a wagon

Based on his calculations on the analyses of one hundred dried mosquitoes, the writer concludes that each of the droppings of a bat contains the skeletal remains of mosquitoes, and as a bat drops upwards of 50 pieces of guano a day he considers that he destroys by each bat to be above 500 per diem. He further states that there are at least five hundred thousand bats per roost.

to be driven underneath at the base, which is provided with a hopper, hinges and which opens downward, enabling the guano to be easily collected.

The defense which this structure affords the bat from its natural enemies is of great importance. These enemies are coons (*Procyon*), opossums, wild-cats, skunks, civet-cats (*Viverra civetta*) and chicken snakes (*Coluber quadrivittatus*). It is during the breeding season, that the bat suffers most from its natural enemies. Shortly after the young are born, they cling mechanically to the mother's body, and very often loosen their hold, and fall to the bottom of the cave, only to become a prey to one of the aforementioned wild animals, who seek bat caves at this particular season. The mother bat darts down after her young and she also becomes a victim to that most noble of characteristics, maternal instinct. The features of protection, and freedom from molestation, will cause the bat to increase so rapidly, that the capacity of the Roost will be soon reached, especially if it be erected in some quiet place, some distance from its habitations.

This bat Roost I erected at the head of a large body of standing water, ten miles south of the city of San Antonio. The inner construction (which is of course the most vital) is based on lines, after long and careful study, entirely in harmony with their most singular habits. A louvered window seen on the outside, forms the entrance and exit for the bats. A red cross on the apex of the roof, designates it as a bat Roost. In choosing the location for the erection of this Roost, it may be well to mention that it was selected because conditions and circumstances in the vicinity of its location could not be more ideal for the breeding of mosquitoes. Into this large body of water, known as Miraflores Lake, flows the sewage of San Antonio, averaging 10,000,000 gallons a day, the extent of territory covered by this lake, is estimated by the owners at 900 acres. It never overflows, as the water is used for irrigation, some by gravity, and some by pumping. The huge amount of organic matter in the water, the large pools formed both by irrigation on the land and water left in the laterals, the receding water in the lake left unused largely, the large pools formed by seepage through earthen dikes outside of the main body of the lake, are the existing conditions, and I am sure that no more exacting demands could be put to the value of the land as destroyers of mosquitoes, than such environments. No swampy low lands is worse.

The Roost was finished on April 2, 1911. Before locking the louver, I sprayed the inside with a chemical fluid giving off an odor identical to the natural odor of the bat, and spread twenty-five pounds of fresh guano, in the hopper at the bottom of the Roost.

On Aug. 4, 1911, or about four months later, it became tenanted by a colony of bats attracted there by the odor, that I estimated at six hundred, from the fact that it took them flying in one constant stream fully twenty minutes. The next year, 1912, the Roost became so thoroughly stocked, that it took them several hours to come out; they came out in clouds. This feature conclusively demonstrates the fact, that bats

used. There are other features employed in the colonization of these areas, and these require time and labor, but one is amply rewarded in the end.

When these little "bird animals" once become accustomed to a place, they never leave it except at night to feed and always return in the morning. During the spring of 1910 and 1911, in studying the period of gestation in bats, I had occasion to catch a great many from an old building and as I could only use the females, I marked every male by cutting a tiny "v," on the right ear, and liberating them from the work room, some three miles from the old building. In a week's time when I again caught a large number from the same place; I would invariably catch some of the same ones again; and in many instances, for the first time, evidenced by the different markings.

It might be said that this vicinity is better favored for the cultivation of bats than others. The answer is very simple. Of course there are more bats in the neighborhood of hills and mountains, than in low lands and swamps because caves are their normal homes, and these are more numerous in hilly and mountainous regions, but the fact remains, that they are easily colonized, and on just such a territory as desired. There are bats in every city, town or village in the world, because the geographical range of the creature, whether of one species or another, like its principal food, extends from Alaska to Patagonia on this hemisphere, and the same holds true on the other half of the world. The Roosts must be built, as said before, entirely in harmony with their habits, or it will prove a failure, known from actual experience in building the first Roost.

The Practical Hygienic and Commercial Results. — A few days ago I made a personal canvas to every family living on the east side of the lake. I spoke to the heads of 14 families, and each one declared to me, that the mosquitoes last year were very much less, than the year before. They also declared that chills had almost vanished. To a man they had no more friends of the bat, and they instructed their children never to molest one.

One of the more prosperous tenants, pointed out to me a sleek and healthy herd of work animals as the best evidence of the scarcity of mosquitoes; he said that during 1910 and 1911 his stock was very thin notwithstanding being well fed, and he was certain the emaciation was due to anemia caused by depletion on the part of the mosquitoes. Several others said that in the same years they were at times driven from the lake by mosquitoes irrigating at night, by the myriads of mosquitoes on the lake. In the year 1912, they scarcely bothered them.

One of the tenants said he had often awakened at night, and found that he thought were hundreds of bats flying about in his cottage, all of them being open on account of the heat; knowing them to be in quest of mosquitoes, he never molested them, neither did the mosquitoes molest him after the bats left. A prominent San Antonio business man who frequently goes duck-hunting on this lake was very much surprised last

year, when he found he was not molested by mosquitoes when resting in the blinds rather late towards evening, in quest of game,

As it becomes essentially necessary that these creatures be not disturbed for some time after finding a new home, I did not go very near Roost, nor allow any one within the enclosed acre. On Dec. 18, after a cold snap, I opened the Roost for the first time, and in between four and five hundred pounds of guano had accumulated in hopper. A sample shows the following chemical analysis:

Moisture	10.70 per cent
Water soluble phosphoric acid	1.30 "
Citrate soluble phosphoric acid	0.35 "
Citrate insoluble phosphoric acid	0.10 "
Total phosphoric acid	1.45 "
Available phosphoric acid	1.35 "
Nitrogen	11.76 "
Ammonia	14.26 "
Potash	0.98 "

As to bats and guano as a commercial proposition, I quote a letter from Mr. Robert P. Marbach, Bracken, Texas, who deals in guano:

I work two bat caves, one 19 miles from Sabinal on the South Pacific Rail-road, the other, seven miles from here (Bracken). They are known as the Frio cave and the Cibolo cave. The Frio cave is a large one and yields about 60 tons annually, but I loose about 20 tons account of its enormous size and colossal boulders, which prevent gathering all of the deposit. The Cibolo cave yields on an average seventy tons annually; it is much smaller than the Frio cave, but the bats are not so scattered, and I have a smaller area to work. I have however the same trouble in this cave that I do in the other, viz. large rocks which prevent me from gathering the entire deposit. I calculate that I lose in this cave, about one car-load. However in a wet year, when all wall holes are full, and there is plenty of water, I count on a heavy car-load more from each cave.

"This business was handed down to me by my father, who carried it for many years. I am supplying his customers, and ship large quantities to Crystal Springs, Jackson and Hazelhurst Miss., though the entire crop of my Cibolo cave I shipped to Laredo, Texas on account of an extensive onion industry which has developed there. I get thirty dollars a ton for my product, put in sacks of about 100 pounds."

In conclusion and as resumé of this work, let me again revert to a few facts:

1. — That the mosquito is unquestionably one of man's most formidable enemies, not only "per se" but also by the subtle role he plays in transmitting disease-producing bacteria.

2. — That the mosquito may be considered as a good food for the bat.

3. — That we can build a home for the bat where it will be protected from its enemies; and propagate in countless numbers, at the same time saving us, by improving our hygienic conditions.

4. — That the commercial feature in the propagation of bats will be its adoption, the hygienic benefits that follow will protect the community which they are erected, especially the poorer classes who know nothing of the dangers of mosquitoes or the use of screens, and amongst them we find the most sickness.

5. — That when we propagate this most useful creature, he not only kills the disease-producing mosquito that serves it as food, but it itself converts that most malevolent of insects into a high grade fer-

The Work of the "Landes-Kulturrat" of Lower Austria in the Promotion of Dairy Farming. — SABATINI, P. in *Landes Amtsblatt des Erzherszogtums Oesterreich* d. Enns, Year 9, No. 11, pp. 21-28, Vienna, June 1, 1913.

During the last three years, the "Landes-kulturrat" of Lower Austria has held a series of courses for the promotion of dairy farming, and has also rendered assistance in the purchase of dairy machines and apparatus, as well as in giving grants to different associations. The courses are divided according to subjects dealt with, into classes for "coolers" managers and milkers. The "coolers" are the men employed by milk-supply associations in the collection, examination, cooling and dispatch of milk; in their course, instruction is given in the principles of the dairy industry, special stress being laid upon the practical handling of the milk and upon milk control on a scientific basis. The courses are always held in the same place, where the necessary rooms, machines and cow-sheds are at the disposal of the students. The course lasts for 12 days; at the end a theoretical and practical examination is held. From November 1910 till April 1913, 11 coolers' classes were held and they were attended by 114 persons. The whole cost of these courses (without teaching material) amounted to £348; this was defrayed by the "Landes-kulturrat".

The object of the managers' course is to instruct the managers of the dairies in superintending the work of their subordinates and teach them how to deal with possible suggestions and justified observations. The subject of instruction are otherwise the same as those of the coolers' course. Five of these courses have been held, attended by 47 persons. The total expenses were just over £59.

The object of the milkers' course is to give, especially to the sons of farmers, an opportunity of learning the theory and technique of systematic milking. The course, however, is not confined to this subject, but also includes the whole field of systematic dairy-cow keeping and treatment. The course lasts one month. Besides the specialist and the dairy instructor, five classes for coolers and managers, some of the milkers' classes are also taken by a vet. The course terminates with a theoretical and practical examination, but after some months, during which the students have practised what they have learnt, a second and entirely practical exami-

nation is held; it is on the results of this that the diploma is granted to the successful candidates. So far, the "Landes-kulturrat" has held five of these workers' courses, which were attended by 47 persons. The total expenses amounted to nearly £452.

905 - **The Live Stock Institute at Louvain in Belgium.** — FRATEUR, J. L. *Nouvelles de l'Institut de Zootechnie de Louvain. Ministère de l'Agriculture et des Travaux Ruraux. Office rural, Rapports et Communications*, No. 5, pp. 81-85. Brussels, 1913.

The Live Stock Institute at Louvain was founded in 1908 for the purpose of the scientific study of all the problems connected with animal breeding. It also affords opportunities to students of the Agricultural section of the University to further prosecute their studies in this direction. The author describes the building and its arrangements and also gives an account of some of the experiments which have already been made, or are in progress. In order to test, in a practical manner, the results of these experiments the Institute is in connection with the agents managing the estates of considerable institutions, and with well-known breeders.

Attached to the Institute is an information bureau, which in 1912 sent out over 80 letters giving advice.

906 - **New Regulations regarding the Admission of Regular Students to the Milan Agricultural College.** — *Gazzetta Ufficiale del Regno d'Italia*, Year 1, No. 102, p. 2545. Rome, May 2, 1913.

A royal decree of April 6, 1913, states that any person wishing to enter the Milan Agricultural College as a regular student must, in future, present a certificate showing that he has passed the final examinations at a "Liceo" or "Istituto tecnico" (1) or else have a leaving-certificate of the last course at the Schools for Wine-Making.

907 - **Agricultural Shows.**

Algeria

1913. September 5-7 - Batna. Live Stock Show (Cattle, Sheep, Horses) organized by the Agricultural Society (comice) of the town.

Australia: New South Wales

1914. January 14-15. — Show of the "Albion Park A., H. and I. Association" M. A. B. Secretary.

January 23-26. — Show of the "Kiama A. Association" G. A. Somerville, Sec.

March 3-5. — Show of the "Uralla A. Association" H. W. Vincent. Secretary.

April 1-3. — Show of the "Upper Hunter P. and A. Association". Muswellbrook C. Sawkins, Secretary.

April 7-15. — Sydney. Show of the "Royal Agricultural Society". H. M. Somerville, Secretary.

Australia: Victoria

1913. September 22-27. — Melbourne Show of the "Royal Agricultural Society of Victoria".

(1) These schools correspond to the matriculation examination of London University. The "Liceo" is the highest school with classical education, and the "Istituto tecnico" corresponds to the stage in technical education.

ustria
August 9-12. — Komotau. Agricultural Show and Twelfth General Meeting of the Beekeepers of German Bohemia.

Belgium
August 9-18. — Ghent. Flower and Horticultural Show organized by the van Houtte Club.
September 6-9. Louvain. International Poultry Show, organized by the Poultry Association of the District of Louvain, under the patronage of the National Federation, of the Municipality and of the Agricultural Comice. For information apply to 21 Rue des Péruis, Louvain.

September 16. — Sibret. — Show of potato-lifting machines.

September 23-27. — De Chassart Estate. Show of mechanical tractors and tilling machines, organized by the Ministry of the Belgian Colonies, with the object of generalizing the use of mechanical tillage in the Belgian Congo. £ 3600 will be given in prizes. The best machines will be bought for the Belgian Congo Colony or will be awarded an indemnity to defray part of the expenses incurred by the exhibitor in taking part in the trials. Entries close on September 1. For information address: Directeur Général de l'Agriculture au Ministère des Colonies, 7 Rue Thérésienne. Brussels.

December 14-15. — Mont-sur-Marchienne. National Poultry Show, organized by the Poultry and Rabbit Club of the Town. Address: Léopold Germain, place du Ves, Mont-sur-Marchienne.

February 7-9. — Iseghem. Fourth International Poultry Show organized by the Hoen-deboudt Neerhof. V. Laridon, Secretary, Café Royal, Iseghem.

Canada
September 15-20. — Fredericton, New-Brunswick. Agricultural and Industrial biennial Show and Fair open to the whole Dominion of Canada and to the State of Maine for Live Stock, Poultry and Agriculture in General; The Industrial Section is open to all. Total of Prizes for Live stock and Agricultural Show. £ 3108; Medals and Diplomas for the Industrial Show. For Information apply to W. S. Hooper, Secretary, Box 150, Fredericton, New Brunswick, Canada.

France
August 9-10. — Perpignan (Pyrénées orientales). Catalan Horticultural Fêtes for the Thirtieth Anniversary of the Roussillon Horticultural Syndicate. Horticultural Fêtes. Garden Competition, General Exhibition of Horticultural Material and Production. Trials of Processes, Material and Machines used in Horticulture. Poultry and Bee Show. Address: Seat of Horticultural Syndicate, Café Garand, Avenue de la Pépinière, Perpignan.

Saint-Julien (Haute Savoie). — Competition for the Construction of Cheese Dairies. — The Agricultural Comice of the District of Saint-Julien-en-Genevois (Haute-Savoie) organizes a competition for the construction of cheese dairies with pigsties attached, the competition is open to all who take an interest in the subject. The plans must be sent in before September 1, 1913 to l'Ingénieur des améliorations agricoles, 46 Boulevard des Brotteaux, Lyons. The prizes will be awarded at the same time that the Show of the District Agricultural Comice of Saint-Julien-en-Genevois will be held at Annemasse, namely September 7, 1913. For information apply to M. Maitrol, Ingénieur des Améliorations Agricoles, 46 Boulevard des Brotteaux, Lyons. or to M. Guilhermet, Professor of agriculture at Saint-Julien-en-Genevois.

September 5-6. — Rive-de-Gier (Loire). Show organized by the Agricultural Society of the Department de la Loire. Entries up to August 25. Apply to J. Biron, Secretary-general of the Society, 27 Rue Saint Jean, Saint Etienne.

September 5-7. — Castres, Tarn. Departmental Show of Stock breeding, Agriculture, Sheep-growing, Horticulture and Packing Material, and Test of Agricultural Ma-

chinery and Implements organized by the Agricultural Comices of Allier, Cantres, Galliac, Lavaur, Mazamet.

September 13-14. — Montbéliard, Agricultural Show organized by the Agricultural Society of Doubs.

September 22-28. — Aray. Show of Brittany Draught Horses and Nags for sale, of Spotted Black Brittany Cattle, Brittany Pigs, Poultry, Bees and Agriculture etc., organized by the Morbihan Agricultural Society. For information: Directeur des Services agricoles à Vannes.

October 3-5. Laval. — Annual Mayenne Departmental Show.

November 6-10. Pau. — Exhibition of Horticulture and Viticulture, organized by the Agricultural and Viticultural Society of Pau. Address: M. Y. Pomès, Secrétaire at Pau (Basses-Pyrénées).

December, Douai. — National Poultry Show organized by the Club of Amateurs and Breeders of the Douais district. Apply to M. E. Mathieu, general, at Roost-Warendin (Nord).

1914. March. Nice. — Great Agricultural and Horticultural Exhibition.

1916. Paris. — International Colonial Exhibition.

Germany.

1912. September 4-5. Uizen. — District Live Stock and Agricultural Exhibition.

September 6-7. Altena, Westphalia — International Rabbit Exhibition, organized by the "Rasse Kaninchenzüchter Verband" for Altena. For information apply to Karl Storch, Rasse-K-Z-V. Altena.

September 6-8. Laufen Live Stock Show of the District.

September 6-11. Mayence. — Twentyseventh Congress of German Vine-growers attached Exhibition of Wines and Apparatus and Utensils used in Viticulture. Wine-making, with Special Scientific Section (Control of Vine Pests; Prob. Birds, etc.) apply to President of Committee: Herr Gündert at Mayence. See September 7-9. Neustadt (Duchy of Coburg) Exhibition of Animal Husbandry, cultural Produce, Machines etc.

September 12-14. Wesel. Agricultural Exhibition, organized by the Association for the Development of the Breeding of the Red Spotted and Black Spotted Cattle of the Lower Rhine (Zuchtverband I zur Hebung der Rindviehzucht (Niederer Rhin. Rot- und Schwarz buntes Vieh), by the Horse-breeders of the Rhenish District (Zuchtverein des Kreises Rees), and by the local Section of the same Association. September 20-20. Eger (Westphalia). — Live Stock Agricultural Produce and Implement Show.

September 27-28. Morbach (Rhine Province). — Agricultural Show.

November 1-4. Offenbach. — Sixth Hessian Poultry Show.

November 15-17. Bretzenheim (Mayence) Twelfth Young Poultry Show organized by the Hessian Rhenish Association (Rhein hessischer Verband).

November 29-30. Kiel. — Poultry Show.

1914. Spring. Berlin — Special Exhibition of the Leather Belting Industry organized by the Association of the German Leather Belting Manufacturers (Verband der Ledertreibriemenfabrikanten Deutschlands E. V.) and held at the same time as the general yearly exhibition of the Union.

1914. June 25-30. Hannover. — Exhibition of the German Agricultural Association (Landwirtschaftsgesellschaft).

Hungary.

1913. September 12-14 Budapest. — Second District Draught Horse Show.

Italy.
Brusegana (Padua) Royal Practical School of Agriculture. — National Competition of Maize Biscuits, organized by the Padua Provincial Commission for the Control of Pellets. Amount of Prizes offered £ 120.

September. Motta di Livenza (Treviso). — Agricultural and Live Stock Show.

September. Milan, Villa Reale. — Exhibition of Table Grapes and of Non-alcoholic Grape Products in Connection with the Fourteenth International Antialcohol Congress.

September. October. Rovato (Province of Brescia). — Agricultural and Industrial Show. Address to the President of the Executive Committee, Sig. Verzeletti, Rovato.

Florence. Prize Competition for Plans of Rural Buildings, organized by the Agricultural Comice of Florence. Entries received up to October 30, 1913. Apply to the Seat of the Comice, 8 Piazza Signoria, Florence.

April 15-30. Rome. — Second Exhibition of Agricultural Novelties with Special Exhibitions of the Roman Campagna, of the Womens' Section, and of the Italian Colonies, organized by the Association of Italian Agriculturists. Apply to the Seat of the Association, 8 Via XX Settembre, Rome.

Spain.
September. Bilbao. — Live Stock and Machine Show for the Provinces of Vascongadas, Navarre, Santander, Asturias, Burgos and Logroño, organized by the "Ayuntamiento" of the Town.

Netherlands.
August 27-29. Ostermündigen. — Sixteenth Bull Show and Market, organized by the Swiss Federation of Breeding Syndicates of the Red Spotted Breed. For information apply to M. G. Luthy at Zollikofen (Berne).

September. Geneva. — International Horticultural Show with Special Competitions organized by the Geneva Horticultural Society.

Swiss.

April. Tunis. — Motoculture Exhibition, organized by the general Direction of Agriculture, Commerce and Colonisation at the request of the Chamber of Agriculture du Nord.

United Kingdom.

September 24-25. Kendal, Market Hall. Annual Exhibition of Honey, Wax and Beekeeping Appliances, organized by the Cumberland and Westmoreland Bee Keepers' Association, and held at the same time as the Congress of the Fruit Growers of the Northern Counties. Apply to G. W. Avery Wetherall, Carlisle, or to Geo. Chatham, Low Green, Staveley, Kendal.

United States.

January 1. — December 31. San Diego, California. — International Exhibition of the Methods of Production.

Congresses.

Austria.

September 21-28. Vienna. — Eighty-fifth Meeting of German Naturalists and Medical Men. One section is devoted to Agricultural Chemistry and to Agricultural Experimentation.

Vienna. — Twelfth International Assembly of the Chemists of the Leather Industry.

Belgium.

September 8-9. Ghent. — Fifty-fourth Pomological Congress of France, under the patronage of the Royal Society of Agriculture and Botany.

September. Ghent. — The International Congress of Horticulture has been postponed to the month of September. Address the Secretary's Office: 79 Avenue Chazal, Brus-

France.

1918. August 20-24. Clermont-Ferrand. — Seventh Congress of Agricultural Cooperatives Mutual Help. Apply to Clermont-Ferrand, 5 Rue de la Treille.

October -13. Ajaccio. — International Congress of Olive Growers, organized by Société Nationale d'Oléiculture de France.

October 16-19. Avignon. — Twenty-seventh Congress of Popular Credit (Agricultural and Urban popular Credit. For adhesions to the Congress address before September 15: M. Maurice Dufourmantelle, Secrétaire du Centre Fédératif, Paris, 95 Rue

Germany.

1913. September 3-6. Breslau. — General meeting of the Deutsche Bunsengesellschaft.
September 18-20. Hamburg. — Thirty-sixth general meeting of the "Verein zur Förderung der Interessen der Chemischen Industrie Deutschlands".

1915. Munich. — International Congress of Brewery Workmen.

Italy.

1912. September 22-26. Siena. — Seventh Meeting of the "Società Italiana per il Progresso delle Scienze".

Spain.

1913. September. Soria. — Agricultural Congress.

Switzerland.

1914. June 8-10. Bern. — Sixth International Dairy Congress, organized by the "Association Universelle de l'Industrie Laitière".

United States.

October 1-4. Atlantic City, N. J. — 53rd. Annual Convention of the U. S. Breweries Association.

October 9-11. Pittsburgh, Pa. Annual Convention of the U. S. Master Brewers Association.

CROPS AND CULTIVATION.

909 — **Evaporation from a Free Water Surface at Lincoln, Nebraska.** — LON G. A. and PERIN, S. W. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 193-197. Lincoln, Nebraska, 1912.

The evaporimeter used at the Nebraska Experiment Station consisted of a galvanized iron pan 3 feet square and 10 inches deep floated on a barge by means of two iron pontoons. A graduated scale is adjusted to the level of the pan and the evaporation is read off daily on the scale, the pan is refilled several times a month. The data obtained during the first six months of the years 1895-1910 are tabulated, together with the records of rainfall, temperature and wind velocity.

910 — **Evaporation from a Plain Water Surface.** — LEATHER, J. W. in *Memorandum Department of Agriculture in India, Chemical Series*, Vol. III, No. 1, pp. 1-15. Calcutta, May 1913.

A description is given of the evaporimeter in use at Pusa which consisted essentially of a circular cement tank 6 1/2 feet in diameter and 5 feet high with an adjustable pointer for measuring the water level. Records for the years 1907 and 1912 are tabulated and compared with other data obtained from observatories at Madras and Lyallpur. The total evaporation was 10.5 inches.

6.42 feet at Lyallpur, and 6.34 feet at Madras, but its between hot and cold weather varied considerably with each season.

Soil Treatments and the Nitrification of the Soil. - PATURKI, G. (Director of the Central Station of Saône-et-Loire) in *Le Progrès agricole et viticole*, Year 30, No. 714. Montpellier, June 8, 1913.

Soil receives annually a varying amount of copper salts in the use of cupric washes as a protection against cryptogams.

Different opinions are held with regard to the probable effect of treatment upon the fertility of the vineyards. Apart from the lytic action, the accumulation of a certain amount of copper in the soil might be injurious to nitrification. In order to investigate this, the writer made the following series of experiments. Five funnels were each filled with 500 gm. of fine, loamy air-dry soil, containing only 3 per cent. of calcium carbonate; 0.5 gm. of ammonium sulphate were added, and the whole was watered with solutions of copper sulphate, so as to introduce the following amounts:

1. None.
2. 10 gm. of copper sulphate (2 % of the soil)
3. 5 gm. " " (1 % " ")
4. 1 gm. " " (0.2 % " ")
5. 0.5 gm. " " (0.1 % " ")

The funnels were placed on receptacles and kept from February 26 until 20 at a suitable degree of moisture in a warm room. The amount of nitrified nitrogen was then determined; the soils were methodically washed, and 500 cm. of drainage water was collected each, which, when analysed, gave the following results:

	Nitrified nitrogen mgm.
1. Control	103.8
2. 2 % of copper sulphate	62.0
3. 1 % " "	71.3
4. 0.2 % " "	88.3
5. 0.1 % " "	94.5

Assuming that the nitrification of the control was almost complete (105 mgm. in place of 103 mgm. furnished by 0.5 gr. of ammonium sulphate), the conclusions are that:

- I. The presence in soil of copper salts affords no special obstacle to nitrification: with above 2 per cent. of copper salts, the nitric nitrogen fell 60 per cent. of that contained in the control, and with 0.1 per cent. of copper sulphate, the nitric nitrogen rose to 90 per cent. of the control.
- II. Copper salts, introduced into the soil, rapidly assume an insoluble form when in contact with calcium carbonate, iron oxide, and

alumina, which accounts for their weak inhibitive action on nitric even when large quantities are employed.

Finally, seeing that the copper which finds its way into the soil the alkaline washes is already in an insoluble condition, there is the reason to apprehend injurious results from the frequent use of washes.

912. — **New System for Draining Land and Freeing it from Salt.** — MOSSERI. *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, Vol. XII, Parts III, pp. 215-239. Montpellier, 1913.

This system of drainage shown in the accompanying Plate is applicable wherever the surface of the soil is somewhat higher than that of the water in the main drainage canal, so as to allow a good drain of the surface water, without however allowing a good drainage of subsoil.

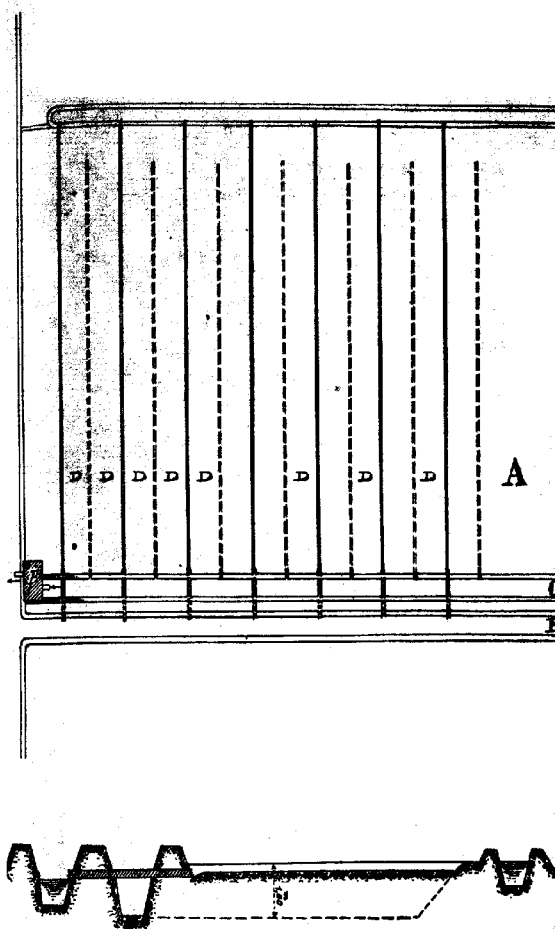
Principle of the System. — This new system, which is a combination of draining the soil and freeing it from salt, is carried out as follows: a collecting ditch (C) 50 to 60 inches deep is opened between the field and the main drainage canal (B). The water collected by the ditch from the field is led into the main canal by means of small wooden pipes and a pump is situated at the end of the collecting ditch (C). In this arrangement a part of the water, namely that which percolates in the soil, is raised by the pump and thus got rid of, while the remaining water flows along the surface. The installation required by this system is simple and not costly.

Application of the system. — It has been applied for the last four years in the irrigation of rice fields in the northern parts of Lower Egypt. Results obtained in 1909 and 1910 have been communicated to the "Institute of Egypt" (1). In 1911 the system was extended to an estate of 1729 acres.

Network of drains. — The drainage ditches must be at least 36 inches deep. A depth of 44 inches appears to be sufficient. The observations made, following Delacroix's method, have shown that these ditches must be excavated at 66 to 132 feet from each other, the distance varying according to the greater or lesser permeability of the soil, its degree of saltness, the rapidity with which it is desired to free the land from salt. The strips of land (D) should not be longer than 670 feet; the most advantageous length would be about 500 feet. The collecting drains that lead to the pumps should not have a fall inferior to 0.25 per 1000.

Pumping station. Amount of infiltration water. — In order to calculate the power of the pumps it is indispensable to know the amount of water drained per acre and per day. The formulae of Slichter and of King, based on the laws of Poiseuille and Darcy allow an approximate estimation

(1) VICTOR MOSSERI, Note sur un nouveau dispositif pour l'évacuation des eaux de drainage et d'assainissement. — *Bulletin de l'Institut Egyptien*. Vol. III, 5th Series, pp. 101-119; and Nouvelles observations sur le système de lavage superficiel combiné; *Ibid.*, Vol. V, pp. 102-136.



Plan and section showing new system for draining land and freeing it from salt.

de of the quantity of water that can percolate through the soil in a time. A direct determination may also be made by means of suitable tubes. The experiments made in 1910 gave as an average 400 cubic ft. of water per acre in 24 hours during the period of low water and during the high water period, and this with the ditches at 66 feet from each other. When this distance was reduced to 33 feet the amount of water rose to 686 cub. ft. during the high water period. In 1911 same period and with 66 feet between the ditches the amount of water ranged from 572 to 686 cub. ft.

Results. — The amount of water removed by pumping in the above bed drainage installation was only one half to two fifths of that would have to be pumped according to the usual system. Further, water removed is 10 to 100 times richer in salt than that removed by surface drainage.

Naturally these figures are not absolute, they only give a general idea of a new process. The results obtained on each of the seven sections at Baharieh have been collected in 14 tables and presented to the Institut Egyptien " (1). The writer gives as a specimen 4 tables referring to sections 6 and 7.

Cost. — This system compared with the usual system of drainage entails somewhat greater expense and a slight diminution of the cultivable area owing to the larger number of ditches. The expenses of installation and upkeep are also heavier; the difference however is not considerable. The loss of cultivable area is between 2 and 3 per cent. The greater expense of installation is about 13s to 14s 6d per acre if wooden pipes are used and 19s to 21s if iron ones are used. The increase in the upkeep exceeds 5 to 10 per cent.

Drainage Experiments in Belgium. — Expériences d'agriculture organisées à l'école de bienfaisance de l'Etat à Ypres en 1912. — *Ministère de l'Agriculture et des Travaux Publics, Rapports et Communications*, No. 5, pp. 75-72. Brussels, 1913.

The object of these experiments was to ascertain the most advantageous of the drains in silty soils. The field to be drained is 2.47 acres and is divided into four sections each of 0.62 acre.

Plot 1	Depth of drain	4 ft. 8 in.	Distance between the drains	33 ft. 4 in.
2	"	4 ft. 0 in.	"	"
3	"	3 ft. 4 in.	"	"
4	"	2 ft. 8 in.	"	"

The field was drained at the end of March 1912 and on April 12 it was sown with potatoes. Every plot contained 52 rows. The seed-potatoes were planted by hand in their holes; the selection and grading was done very carefully. The weather was very rainy. The crop was lifted on September 10.

1190 PERMANENT IMPROVEMENTS. — DRAINAGE AND IRRIGATION

ber 28 and 30, each plot being harvested separately, and the potatoes were graded into large, small and diseased, each kind being weighed by its weight. The following table shows the results.

Number of Plot	I	II	III	IV
Depth of Drain	4 ft. 8 in.	4 ft. 0 in.	3 ft. 4 in.	2 ft. 1 in.
	cwt.	cwt.	cwt.	cwt.
Large potatoes	79.30	83.83	102.85	96
Small	16.52	15.69	15.78	14
Diseased	14.64	12.83	9.60	10
Total yield	110.46	112.35	128.23	120
Yield per acre	178.84	181.87	207.58	196

The third plot, in which the drains were at a depth of 40 inches, gave the greatest yield and the smallest quantity of diseased potatoes.

914 — **Warping in England.** — STEPHENSON, J. in *Journal of the Royal Agricultural Society of England*, Vol. 73, pp. 104-113. London, 1912.

Arthur Young describes the process of warping in the following words: "The water of the tides that come up the Trent, Ouse, Don, and other rivers which empty themselves into the great estuary of the Humber, is muddy and an excess, insomuch that in summer, if a cylindrical glass twelve or fifteen inches long be filled with it, it will presently deposit one inch, and sometimes more, of what is called "warp". Where warp comes from is not known. The Humber at its mouth is clear water; and no floods in the country washed by warp rivers bring it, but on the contrary do much mischief by spoiling the warp. In the very driest seasons and longest droughts it is best and most plentiful. The improvement is perfectly simple and can be effected in nothing more than letting in the tide at high water to deposit the warp and permitting it to run off again as the tide falls; this is the aim and effect of the system.

The system probably dates from about 1730, and though found in limited extent in other parts of the country, extensive areas are met with only in North Lincolnshire and South-East Yorkshire where it covers now about 300 square miles.

In olden times, the high tides used to overflow onto either side of the river bed, and the water, having deposited its sediment, drained off to the low lands further away. When the rivers were banked in, $\frac{1}{2}$ a mile wide on either side became fertile tracts of land which were esteemed as they were well drained and produced good crops in seasons. Behind these strips there exist tracts of lower land

ring to their being below the level of the river. Such land, which is of little value in its natural condition, immediately becomes valuable if it can be covered with a thick coating of warp, and if not too distant from the river it may be subjected to the process. The area is surrounded by a bank and connected with the river bed by means of a warping channel which is provided with sluice gates. The richly charged tide water is then led into the basin as the tide rises, deposits its sediment and runs out again as clear water on the ebb. The process is carried out twice a day during the spring tides (i.e. the highest tides) of the summer months, but not in the late summer or in winter, and as each flooding may result in a deposit of an eighth of an inch when dry, in 2 or 3 years the surface may be raised 2 to 3 feet. The flooding is then stopped and white clover is sown. Whilst under that crop the land is drained by means of ditches discharging into the warping channel which thus becomes a main arterial drain. Later the land is cut up into farms of 150 to 200 acres, buildings are erected and the farms are let at £2 per acre or more.

One district deserves special mention and that is Thorne Moors. Covering an area of 16 square miles between the rivers Trent and Ouse, it is a comparatively high piece of peat land, which until recently was a dangerous swamp. It has now been dried by means of deep ditches and the peat being exploited commercially. At the same time the removal of the peat raises the surface of the soil and thus renders it available for warping and arable cultivation.

The cost of reclamation by warping varies within wide limits according to general conditions. It is naturally reduced if the sluices, which form one of the heaviest expenses, can be made to serve for a very large tract of land, say two or three thousand acres. In the case of Thorne Moors the cost has been estimated at £20 per acre, which includes the cost of preparing the land for farming but not the erection of buildings; this estimate would probably be lower than most as the circumstances in this undertaking are especially favourable.

Warp land on the whole is very well farmed and first rate crops are obtained. Potatoes are the most important crop, being highly manured and producing 10 to 12 tons per acre. They are followed by wheat which yields 8 to 9 quarters per acre and then by a root or forage crop. Sheep, with the exception on warp farms, but cattle are kept, and a large number of pigs are reared and fed to provide an economical means of disposing of waste and diseased potatoes.

- **Irrigation Experiments at the Experimental Farm of the Royal-Imperial College of Agriculture at Gross-Enzersdorf (Austria).** - *Zentralblatt für Landwirtschaft*, Year 93, No. 9, pp. 101-112. Brunn, May 1, 1913.

The area to be irrigated was a 10 acre field of lucerne, which at the beginning of the operations, was in its fourth year. As levelling was impossible and the nature of the ground precluded the use of irrigation the field had to be flooded. The experiments were made in 1909 and 1910. The five years' precipitation observations made at the experimental farm showed a normal deficit in the rainfall accentuated

by the unfavourable distribution of the rains. Underground water could be employed for irrigation, as surface-streams were lacking. water was raised by means of centrifugal pumps driven by benzine-motors. Of the 10 acres, an area of 1 hectare (2.47 acres) was selected for experiment. This was divided into 10 plots of a quarter of an acre each. One plot remained unirrigated and acted as control. The other plots were so irrigated that three received about 148 000 cu. ft. of water during the vegetative period, three received 258 000 cu. ft., while the other four were only irrigated in the autumn. All the lots were manured alike.

The following results were obtained:

On the unirrigated plot, there was a close relation between the temperature and the time of harvest and also between the rainfall and amount of the crop. This plot yielded three crops with 28 cwt. of substance per acre. Only the first crop was satisfactory, the others being poor and unreliable.

Four crops, however, were obtained from the irrigated plots, average results being as follows:

1. Plots irrigated during the vegetative period with 148 000 cu. ft. of water produced 4 tons of dry matter per acre.
2. Plots irrigated during the vegetative period with 258 000 cu. ft. of water yielded 3 tons of dry matter per acre.
3. Plots which were only irrigated in the autumn yielded $3\frac{1}{2}$ tons of dry matter per acre.

Thus an excess of moisture caused a decrease in the crop. technical preliminary investigations were carried out by the prof. of agriculture at the College, Dr. R. Fischer (Civil Engineer).

916 - **Irrigation Experiments with Brackish Water.** — Report of Prof. ORSINI to the President of the Italian Royal Irrigation Commission. In IV^o, pp. 21, 1911.

In the Province of Bari there is a strip of cultivated land along the Adriatic coast irrigated by water which is perceptibly brackish owing to infiltration of sea water through the crevices of the limestone subsoil. The land is chiefly under tomatoes, but various brassicas, capsicums, the egg plant, and even in some places cotton, are also cultivated. Owing to this fact, in 1911, a Royal Commission on Irrigation recommended that a series of experiments should be undertaken using water of different degrees of salinity, in order to ascertain whether it would be possible to utilize brackish water for irrigation on a large scale. The experiments were carried out in 1912 by the Station of Agricultural Chemistry of the Royal College of Agriculture at Portici in the district of Vitulazio near Capua. Pot culture was adopted and brackish water from the Province of Bari was used.

The analyses of 30 samples of this water are given. Its composition varies. In the case of the minimum salinity, the dry residue at 100° C. was 0.272 per cent., the chlorides calculated as NaCl were 0.0424 per cent., and the carbonates calculated as Na_2CO_3 were 0.0424 per cent. In the case of the maximum salinity the dry residue at 120° C. was 0.588 per cent., the chlorides calculated as NaCl were 0.588 per cent., and the carbonates calculated as Na_2CO_3 were 0.0424 per cent.

calculated as Na_2CO_3 were 0.0466 per cent. Detailed analyses of it too are given, showing that it was clayey, and good both with respect to its mechanical structure and its chemical composition; and analyses are also given of the water used for the experiments (dry residue at 100° C., 0.7389 per cent; at 180° C., 0.684 per cent.). The trials were begun late in the season (July); they were therefore regarded by the writers as preliminary, and will be continued. Nevertheless the results obtained up to the present are tabulated in great detail. Of cotton, chicory, maize and tomatoes were planted in zinc vessels, containing 82 to 84 kilos (180 to 185 lbs.) of soil, and manured by the addition of 12 grams of bicalcic phosphate and the same amount of ammonium sulphate. The cotton and chicory died off, and were discarded, but the two were each watered with four different solutions:

- a) pure water (from Serino);
- b) water containing $\frac{1}{4}$ of the total salts (0.1847 per cent);
- c) water " $\frac{1}{2}$ " (0.369 ");
- d) water " $\frac{3}{4}$ " (0.5541 ");
- e) water " total salts (0.7389 ").

The plants were watered when they appeared to need it, and received time sufficient to form a stratum of from 1.2 to 3.6 cm. deep, the total amount received being 36.6 cm. in the case of the maize, and 33.6 cm. in the case of the tomatoes. The cultures were sheltered from rain.

During the vegetative period the maize plants appeared to suffer from salts, especially when they were present in the larger quantities, while on the other hand, the tomatoes seemed in no wise affected by the salts added to the soil, although these were present in the proportion of 5 tons per acre in the receptacles watered with the strongest solution. The area of each pot was 1.8 sq. ft. and there were 3 plants of maize or 2 to 3 tomatoes in each. At harvest-time (October 26) the results obtained were as follows:

Watered with	fresh water	$\frac{1}{4}$ strength	$\frac{1}{2}$ strength	$\frac{3}{4}$ strength	undiluted
	gms	gms	gms	gms	gms
average weight of each plant	46.5	32.8	28.15	26.15	28.7
average weight of each fruit	105.9	58.45	67.1	56.8	97.0
weight of fruit of each plant	101.6	57.4	62.8	53.4	93.6

In the case of maize the yield decreased with an increase in the case of the tomatoes, the maximum weight of plant was obtained with least salt, but the weight of fruit obtained with the maximum amount of salt was greater than that obtained with the smaller doses, though less than when fresh water alone was used. With reservations as to the reliability of the results when calculated into yields per acre, the writers note that, irrigated with fresh water yielded within four months at the rate of 9 cwt. of dry matter per acre, and when irrigated with entirely brackish water the yield was a little less than half. Tomatoes with fresh water yielded the rate of 18.3 cwt. of dried stems and leaves per acre and 121 cwt. of fruit per acre, while with wholly brackish water the weight of the stems and leaves would be 20.3 cwt. and that of the fruit 111.5 cwt.

In subsequent experiments cotton and lucerne will be used, as well as the two above-mentioned plants.

917 - **Fertiliser Experiments on Peaty Meadows in Hungary.** — Gyárfalusi, in *Köztud.*, Year 23, No. 43, pp. 1553-1554, Budapest, June 7, 1913.

Repeated manurial experiments on peaty meadows carried out at the Royal Agricultural Station of Magyaróvár had shown the efficiency of phospho-potassic manures for increasing the yield of hay both qualitatively and quantitatively, and in 1909 in order to popularise the use of this kind of fertilizer on the peaty meadows of Hungary, the Experimental Station undertook a series of new trials, partly on the grass lands at the bordering the Lake of Balaton, and partly on the land, belonging to the local government at Haromszék. For each trial two plots of 1 kántár (1.42 acres) each were selected; one acted as control and the other received 440 lbs. of superphosphate and 165 lbs. of 40 % potassic fertilizer (3 cwt. of superphosphate and 1 cwt. of potassic fertilizer per acre). They were made in 40 different places, but of these only 24 gave reliable results which may be divided into 3 groups showing the effect of the manure the yield of hay 1, 2, and 3 years after the application of the manure. The figures are given in the adjoining table.

The mean increases in yield show that peaty meadows answered to the application of fertilizers, the increased yield per acre amounted 15.2 cwt. the first year (mean of 24 experiments), 9.4 cwt. the second (mean of 17 experiments), and 5.0 cwt. the third year. The cost of the above dressing should not be above £1 10s per acre, and if the hay is valued at 1s 9d per cwt. the application of the phospho-potassic dressing is evidently highly remunerative.

Locality	Increased yields of hay per acre due to manuring			
	1910	1911	1912	Total
	cwt.	cwt.	cwt.	cwt.
<i>Results of 1 year</i>				
Mosonszentpéter I	16.7	—	—	—
" II	19.3	—	—	—
Mosontétény I	26.5	—	—	—
" II	16.7	—	—	—
" III	29.9	—	—	—
Igricse	13.9	—	—	—
Lukafa	8.3	—	—	—
Mean	17.7	—	—	—
<i>Results of 2 years.</i>				
Mosonszentpéter III.	13.2	15.2	—	28.4
" IV	13.9	19.3	—	33.2
" V	66.8	19.3	—	86.1
Mosonszentjános I	7.0	8.3	—	15.3
" II	8.3	13.9	—	22.2
Mosontarcsa I	16.0	15.8	—	31.8
Tapolca	13.9	13.9	—	27.8
Pötréte	4.3	5.8	—	10.1
Kéadimartonfalva	2.2	8.9	—	10.2
Mean	16.2	13.3	—	29.5
<i>Results of 3 years</i>				
Lébény I	6.3	3.6	4.1	14.0
" II	12.6	14.7	14.5	41.8
" III	9.3	9.1	5.5	23.9
Mosontarcsa II	28.5	3.4	7.0	38.9
Buk	16.7	6.7	4.1	27.5
Zalaapáti	8.0	1.6	1.0	10.6
Óztergály	10.5	3.6	1.9	16.0
" I	6.6	4.2	2.5	13.3
Mean	12.3	5.9	5.0	33.2
Total means	15.2	9.4	5.0	—

918—**New Experiments on the Utilization of Phosphates in Russia.** — 1. CHEKOV, V. in *Izvestia Moskovskogo Sel'skokhoziaistvennogo Instituta*, Year XIX, pp. 33-55, 55-59, 60-68, 69-72 and 203-222. Moscow, 1913. — 2. PERITOURIN, N. *Ibid.*, pp. 142-151. — 3. JAKOUSHEKIN, I. V. *Ibid.*, pp. 152-178. — 4. GALZEV, P. and JAKOUSHEKIN, I. V. *Ibid.*, pp. 193-204 and 223-232.

The above papers describe the continuation of experiments made in Prof. Prianishnikov's laboratory at the Moscow Agricultural Institute, the object of utilizing the poor phosphates of Central and Eastern Russia.

M. Kotchekov reports experiments, made at the instigation of Prof. Prianishnikov, on the use of sodium bisulphate (industrial residue from the manufacture of nitric acid) in concentrated solutions ($D = 1.475$) for treating Viatka phosphates (57.7 per cent. tricalcic phosphate) and Smolensk phosphates (32.6 per cent. tricalcic phosphate), dissolving respectively 97 and 95 per cent of the total phosphoric acid. On treating the solution with milk of lime, a precipitated phosphate was obtained containing an average of 25.3 per cent. of P_2O_5 of which 92.6 per cent. was soluble in Petermann ammonium citrate; the Viatka phosphate alone gave 37 per cent., with 95 per cent. citrate-soluble, while the Smolensk gave 22 to 34.4 per cent. and 98 to 66 per cent. citrate soluble.

The residue from the manufacture of trinitrotoluene contains, after the third nitration, an average of 62 to 72 per cent. of sulphuric acid, 2 to 3 per cent. of nitric acid, and 0.3 per cent. of organic matter. The results of experiments in preparing superphosphates from Viatka phosphates by means of this residue and by ordinary sulphuric acid are given in Table I.

TABLE I.

	Nitro superphosphate			Ordinary superphosphate				No.
	No. 122		No. 154	No. 31		No. 32		
	Not dried	Dried at 85°		Not dried	Dried at 85°	Not dried	Dried at 85°	
Sulphuric acid at 52° Beaumé used for treating 20 parts of phosphate . .	13.2		13.2	13		13.5		14

Analysis of the superphosphates (calculated on the dry matter)

Total P_2O_5	17.2	17.3	17.9	17.1	17.0	16.8
Citrate-soluble P_2O_5 . .	—	—	—	16.4	16.2	16.7
Water-soluble P_2O_5 . .	15.24	13.7	15.4	12.9	12.6	14.0

(1) See No. 898, B. June 1912.

The analyses show the good quality of the *nitro*superphosphates, which are also drier and more powdery than the ordinary super.

Fresh experiments were undertaken on the preparation of double phosphates by using sodium bisulphate. Superphosphate prepared

Viatska phosphates and sodium bisulphate was dissolved, and the solution was concentrated on a water-bath, the crystals of sodium sulphate formed being removed. When concentrated to 45° Beaumé the solution contained 20 to 22 gms. of P_2O_5 per litre and attacked degelatinized dust vigorously; by this means a double superphosphate was formed containing up to 24.3 or 25.6 per cent. of P_2O_5 , of which 98.3 or 92 per cent. was water-soluble; this product contained some sodium sulphate but its physical properties were satisfactory.

Experiments were made on the preparation of superphosphates with sulphuric acid residue from the purification of petrol. This residue contained 931 gms. of sulphuric acid per litre, with a density of 49.6° Beaumé; it was used on amounts between 50 gms. and 2 kg. of degelatinized bone and Viatska phosphate, and on a larger scale on 20 kg. of Viatska phosphate. The phosphoric acid of the bones was almost completely dissolved, the result was a superphosphate containing 21.25 per cent. of total P_2O_5 and 21.12 per cent. water-soluble; the super from the Viatska phosphate contained 14.27 per cent. of total P_2O_5 and 12.74 per cent. water-soluble. Both the products were sufficiently dry and powdery.

f. Peritourin has studied the conditions of equilibrium occurring during the preparation of double superphosphate by means of sodium bisulphate. His purpose phosphoric acid and sodium sulphate were dissolved in proportions in which they are formed when calcium phosphate is treated with sodium bisulphate; as the evaporation over the water-bath proceeded, recrystallization of sodium sulphate with a little monosodium phosphate took place; at a density of 1.40, only 5 per cent. of the P_2O_5 was precipitated.

Following previous culture experiments in Prof. Prianishnikov's laboratory M. Jakoushkin has carried out sand-cultures of oats, barley, wheat and millet for three years; he has confirmed the fact that certain Russian phosphates may serve directly as a source of phosphoric acid for Gramineae. These phosphates give results only a third below those with soluble phosphates. Other phosphorites from the governments of Simbirsk and Novgorod have proved to be utilizable by Gramineae, if not totally, at least to some extent as the Sengulley phosphates, as regards the nearly insoluble phosphorus of plants. These phosphorites come from the Gault, and all phosphorites of the Cretaceous period possess this valuable property. These phosphorites are highly soluble in ammonium citrate (Wagner's reagent's). By three extractions with Wagner's reagent about 20 per cent. of the P_2O_5 was obtained from an ordinary phosphorite, and over 50 per cent. from the Sengulley phosphorite. Petermann's reagent extracted about 10 per cent. of the P_2O_5 from Sengulley phosphorite, but only traces from the general phosphate. These results encourage the hope that cer-

tain mineral phosphates of the Albian (Gault) series may be used direct manure.

Pot cultures in sand carried out by MM. Galzev and Jakoushkin, plants possessing considerable power of assimilating phosphoric acid (flax, buckwheat, mustard), confirm the comparatively easy assimilability of the Albian phosphates, and in particular of those from Sengulley.

Some of the results are shown in Table II.

TABLE II.

P_2O_5 in the crop, mgm. per pot.

Phosphorite	Yellow lupins		Buckwheat
	I.	II.	
Sengulley (Gault)	60.96	96.89	1021
Sinenkije (Gault)	—	82.13	—
Mangishlak (Gault)	—	—	771
Penza (Neocomian)	41.92	—	—
Durman (Turonian)	20.45	—	—
Burluk (Turonian)	—	43.75	711
Novoselki (Rjasen)	—	—	491
Kusjminski (Rjasen)	—	—	271

Using cultures in pots containing 4 kg. of sand, M. Kotchekov studied the comparative action of the phosphoric acid soluble in ammonium of the various phosphatic manures. In the fourteen series of experiments with flax, oats and millet, the nutritive elements were used in the usual quantities, except in the case of phosphoric acid, which was given at half strength so that any lack of it would show up better. The amount added was 0.142 gm. of P_2O_5 , either dissolved in citric acid, or citric acid and water, or in an insoluble form. Table III shows the phosphatic manures used.

The experiments showed that the value of the phosphoric acid soluble in Petermann's ammonium citrate varies considerably. Thus the action of that from basic slag and precipitated phosphates was excellent, while that from washed superphosphate and bone dust was almost none. Results were given by washed Viatka superphosphate, which had a satisfactory action, and Smolensk precipitated phosphate (obtained by the bisulphate and first product of precipitation by lime), which had a satisfactory action.

Considering the importance for Russian agriculture of a local supply of phosphatic manures, these investigations have shown that Russian phosphorites, in spite of their relative poverty, present possibilities of economic utilization a) by treatment with residues of other industries; b) by direct use of those specially suitable for the purpose.

919 - **The Phosphate Question in Tunis.** — BERTAINCHAUD, E. (Director of the Special Laboratory for Agricultural and Industrial Chemistry in Tunis). *Les Phosphates Tunisiens: leur Origine et leur Assimilabilité. Exportation de l'Acide Phosphorique par les Râcôtes.* — *Revue agricole et viticole de l'Afrique du Nord*, Vol. II, Nos. 54, 55 and 56, pp. 268-270, 292-297 and 323-325. Algiers, March 22 and 29, and April 5, 1912.

The soils of Tunis are generally poor in phosphoric acid, both as to basic phosphate and as assimilable phosphoric acid. The high lime content checks the dissolving action of the weak acids in the interstices of the soil.

Tunis is a cereal-exporting country, and though the reserves of fertility are considerable, the soil eventually becomes worn out, and the low yields show that these reserves are now considerably reduced.

The final estimates of the Food Supply Committee of the Regency fix the yield of wheat at 4 qx. per ha. (nearly 6 bu. of 60 lbs. per acre) over the whole area under cultivation; analyses made by the writer furnish the following data.

Cereals exported from Tunis during the period 1907-1912	P ₂ O ₅ exported	
	% of grain	total
Wheat 126 320 tons	0.82	1 036 tons
Barley 356 600 "	0.72	2 568 "
Oats 244 400 "	0.55	1 344 "
		Total = 4 948 tons
Livestock exported from Tunis during the period 1907-1912	P ₂ O ₅ exported	
	Weight of bones	
583 113 head	4 393 tons	878 tons = 878 "
		Total P ₂ O ₅ exported 5 826 tons

This amount represents a real loss for Tunis, as the corresponding imported products are consumed in the towns and leave no residues for agricultural use.

But Tunis possesses some of the most important deposits of phosphate in the world; only they cannot be used direct, even finely ground, owing to the amount of limestone in Tunisian soils, except the sandstone so of Kroumiria.

In this connection, the writer remarks that, with an exportation of 1 828 000 tons of phosphate from Tunis in 1912, there is a mean annual importation for the period 1907-12 of 4601 tons of superphosphate, corresponding to 2037 tons of calcium phosphate (1).

(1) According to a report sent to us by the Director-General of Agriculture and Colonization, a new local factory, with a potential output of 20 000 tons on the market in 1912. This would account for the lowering of the 9184 tons in 1911 to 2759 tons in 1912. See: *Production et consommation*.

The average phosphoric acid content of soils in Tunis is 0.08 per cent ; skoning a density of 1.5 and a depth of 8 in. of ploughed soil, there would 2130 lbs. of P_2O_5 per acre ; to reach the 4450 lbs. given by Joulie for normal fertility, 2320 lbs. must be added ; this would mean applying $6\frac{1}{2}$ us of super at 16 per cent., or $3\frac{1}{2}$ tons of a phosphate at 30 per cent., making expenditure of £ 16 or £ 6 per acre. But it would no doubt be sufficient to replace twice the amount removed : a good average crop of wheat of bu. would remove 20 lbs. of P_2O_5 ; this could be replaced by 270 lbs. of perphosphate at 16 to 17 per cent., making (at present prices) a total cost 75 6d per acre. This would be amply repaid by $1\frac{1}{2}$ bushels increase the crop of wheat, where as an excess of 6 bu. ought easily to be got (1).

In conclusion, the writer remarks that in Tunis superphosphates should be used in by deep ploughing some time in advance, to give the best results.

— **Consumption of Superphosphates in Hungary.** — KOVÁCSY, BÉLA, in *Közelet*, Year 23, No. 42, pp. 1532-1533. Budapest, June 4, 1913.

The above paper gives interesting data as to the consumption of superphosphates in Hungary, showing the average quantity used on a given area of cultivated land for every county, in 1907, 1911 and 1912.

The data, however, refer exclusively to the super produced in and sold the factories affiliated to the Hungarian Association for the Use of Chemical Manures, and do not include the amounts imported ; nor do they refer to other chemical manures. Superphosphate, however, is by far the most important manure in Hungary, its consumption reaching 80 per cent. the total for chemical manures.

In a detailed table, the writer gives the figures collected in the 63 counties, dividing these into four groups according to the quantity used in 1911 and 1912. The figures of the three years show variations between $\frac{3}{4}$ lb. to 72 lbs. per acre (0.5 kg. and 46.6 kg. per arpent cadastral), but on the whole show a marked progressive increase.

The following table shows the grouping of the counties for 1911 and 1912:

- Group I. (8 counties): consumption more than 25 kg. per arpent cadastral (38 lbs. per acre).
 Group II. (12 counties): more than 10 kg. per arp. (15 lbs. per acre).
 Group III. (16 counties): more than 5 kg. per arp. ($7\frac{1}{2}$ lbs. per acre).
 Group IV. (27 counties): less than 5 kg. per arp. ($7\frac{1}{2}$ lbs. per acre).

The total averages for the four groups, in lbs. per acre of cultivated land, are as follows:

	1907	1911	1912
	—	—	—
Group I.	16.7	36.2	44.2
II.	6.4	18.4	21.5
III.	3.3	9.5	10.9
IV.	1.0	3.0	3.4

921 - Experiments with Radio-active Substances. — BERTHAULT, E., BÉRIOT, and BERTHAULT, P. in *Annales de l'École Nationale d'Agriculture de Grignon*, Travaux du Laboratoire d'Agriculture 1910-1911-1912, Vol. III (Agriculture), pp. 1-10, Paris, 1912.

The writers remark that the question of radio-active manures is a very obscure; to test the matter for themselves they have made a series of laboratory experiments and culture trials (1).

Laboratory experiments — The introduction of uranium protoxide 0.05 to 1 per cent. into Knop culture solutions had good effects on some plants (French beans), and markedly harmful effects on others (barley, maize); the results with barley suggest that the optimum amount of the radio-active substance had been passed.

A sample of radio-active manure sent by the Radium Bank was declared to have the following percentage composition; silica, 80.44; water and volatile organic matter, 10.54; oxides of iron and alumina, 2.21; total sulphuric acid, 5.40; soluble phosphoric acid, 1.37; soluble salt and soluble free acids, 3.32; uranium, traces; samples very variable, especially in free acids and phosphoric acid.

The writers found that this contained only 0.1109 per cent. of total phosphoric acid, and that the radio-active energy was less than 0.01 of mineral uranium oxide. In spite of its doubtful composition, it has given an increase in the fresh weight of wheat in culture experiments.

On the whole, this first series of experiments seems to show that in the first stages of growth of plants radio-active substances have a favourable action on the increase of green weight.

Field experiments (1910-1911). — The radio-active manures have been tried, according to the recommendations of the Radium Bank, in very small quantities as compared with other nutritive substances, chiefly at 2 or 3 per cent. of a dressing of superphosphate, but ranging from 1 to 10 per cent. The radio-active manure was applied alone, with superphosphate with blood, with superphosphate and blood, and with superphosphate, blood and a potash manure. The following series of experiments were established: wheat (two series, one in pots); rye (one series); barley (two); oats (four); pulse crops (two); Leguminous fodder crops (one); fodder grasses (one); oil crops (four); flax (one); potatoes (two, one with old and fresh radio-active manure); Jerusalem artichokes and heliopsis (one).

The following table gives the number of experiments showing an excess (+) or a deficit (—) on the means of each series; the experiments with fresh radio active manure are not reckoned.

(1) See No. 781, B. May 1912; No. 1513, B. Nov. 1912; and No. 1913.

	Radio-active manure used				
	alone	with super	with blood	with super and blood	with complete manure
weight of crop	6+, 8—	12+, 1—15—	1+, 1—	2+	2+, 1—
dried or green stems . .	7+, 6—	18+, 1—20—	1+	+	2+, 1—
.....	6+, 8—	17+, 22—	2+, 1—	2+, 1—	2—, 1—
.....	1+, 9—	4+, 2—	"	"	12+, 4—

The following conclusions may be drawn from these results :

a) Radio-active manures alone may or may not be advantageous ; number of positive and negative results is about equal for the total of the plants, and for the stalks and grain, but the negative results are more numerous for the tubers.

(b) The addition of radio-active manures to superphosphate is generally favorable, particularly for the grain ; for tubers, however, it is variable. The following table shows the action of the radio-active manure added in varying proportions to superphosphate.

	1 % (2½ and 3½ lbs. per acre)	2 % (5 and 7½ lbs. per acre)	3 % (8 and 9 lbs. per acre)	5 and 6 % (11 and 18 lbs. per acre)	10 and 15 % (27, 36, 45 and 67 lbs. per acre)
plant (stem and seed) .	4+, 3—	5+, 1—, 5—	2+	"	1+, 7—
dried or green stems . .	2+, 1—, 4—	6+, 3—	6+, 3—	1+, 2—	3+, 11—
.....	4+, 3—	5+, 6—	7+, 6—	"	1+, 7—
.....	1+, 1—	1+, 1—	"	"	+

Radio-active manures at 1, 2 and 3 per cent. seem to have no effect, 10 and 15 per cent. the negative results increase, except for tubers, which the figures are not decisive.

c) the addition of radio-active manure to dried blood was made in a few experiments, but the positive results seem to predominate.

d) With the addition of radio-active manure to a mixture of superphosphate and blood, the positive results are the more numerous, both for tubers and for grain.

e) The addition of radio-active manure to a complete manure generally yields even of tubers.

These field trials do not allow practical conclusions to be drawn; further experiments are necessary. What seems certain is that it is not advantageous to employ as much as 18 or 45 lbs. of catalytic manure with superphosphate alone. Radio-active substances seem to be more efficacious in the presence of a complete manure than with phosphatic or nitrogenous manure only; in this case the best action is with dressings of 36 to 45 lbs per acre.

922 - The Assimilating Energy of Plants Cultivated under Different Light Intensities. (1) - ROSE E. in *Annales des Sciences Naturelles, Botanique* Vol. 2, No. 1-4, pp. 1-110, Paris, April and May 1913.

While various investigators have examined the effect of light intensity on the development and structure of plants, others have studied assimilation under different degrees of illumination, and the present experiment was undertaken to connect the two series of investigations. The experiments were carried out at the Biological Laboratory at Fontainebleau during the summer months June to September.

The subjects of the research were *Teucrium scorodonia* and *Peucedanum sativum* chosen as being typical shade and sun-loving plants respectively and the various light intensities were obtained by using shelters covered with woven material of different textures. Five grades of light intensity or illumination were employed, as follows:

- I = $\frac{1}{10}$ of the unshaded light
- II = $\frac{1}{8}$ " " "
- III = $\frac{1}{6}$ " " "
- IV = $\frac{3}{8}$ " " "
- V = unshaded light.

The A. treats his results under five different headings:

The influence of light intensity on the production of green matter and also on the external appearance of the plants.

Leaves were taken from *Teucrium scorodonia* at 3 different stages of the development of the plant and their area and green weight determined. At the end of the experiment the whole plants were separated into root and shoot, and analysed for green and dry matter.

Both the weight and the area of the leaves were at their maximum in illumination III, but the weight per unit area, or in other words the thickness of the leaf was greatest in direct sunlight and diminished with each reduction of the light intensity. Turning to the effect on the plant as a whole, both green and dry weights diminished with each degree of shading while the water content increased, but the effect of decrease

(1) See also No. 351 B April 1913.

A) Leaves only.

Illumination	Area in cm ²					Green weight. in mg.				
	I	II	III	IV	V	I	II	III	IV	V
<i>Pisum scorodonia</i> :										
leaves developed . . .	—	0.1	0.2	0.2	0.1	—	5	8	9	5
" " . . .	—	0.5	0.9	0.4	0.3	—	28	52	34	28
alt. plant	0.2	5.1	6.5	3.6	1.2	7	285	405	312	126
<i>sativum</i> :										
leaves developed	—	0.42	0.48	0.55	0.5	—	56	61	75	82
" " . . .	—	1.0	1.4	1.7	1.2	—	82	135	173	159
germinating	—	1.2	1.6	2.7	2.7	—	92	123	280	180
germinating	—	0.7	1.0	1.8	1.3	—	52	100	176	145

B) Whole Plant.

	<i>Taucrium scorodonia</i>				<i>Pisum sativum</i>		
	II	III	IV	V	III	IV	V
weight gms.	21.82	48.35	54.95		32.3	58.3	81.2
" " " "	3.96	9.90	16.06		4.0	8.35	12.91
per cent of whole plant	91.00	88.00	80.4	70.9	—	—	—

light acted in opposite directions on root and shoot respectively, the live proportion of shoot increasing as the shade deepened. (I)
 With *Pisum sativum* the leaves were measured and weighed at 4 different stages of plant development, and the general results resembled those obtained with *Taucrium scorodonia* only that *Pisum sativum* showed far less tolerant of shade, so that the optimum illumination for development of the leaves shifted from III to IV, and, while the green

Illumination.	green wt. of plant, gms.	% shoot in plant	wt. of shoot, gms.
III	48.35	88.0	42.5
IV	54.95	70.9	38.9

of the plant or, in other words, the crop is therefore larger in illumination (E4).

weight per unit area (i. e. thickness) of the leaves at illumination II only about $\frac{1}{2}$ smaller than that of the leaves developed at illumination V in the case of *Teucrium scorodonia*; the green weight per unit area of leaves developed at illumination V was twice as great as that of leaves developed at illumination II. Moreover when considering the development of the plant as a whole, the drop in green and dry weight at each degree of shading was much more sudden with *Pisum sativum* than with *Teucrium scorodonia*. *Pisum sativum* flowered and fruited in illuminations V and IV, and flowered but failed to fruit in illumination III but in illumination II the plant was pathologically affected. *Teucrium scorodonia*, on the other hand, was apparently normal, though reduced in size, even in illumination II.

The chlorophyll content of the leaves was estimated by Lubimov's colorimetric method. The results show that the chlorophyll content increased with shade and was higher in *Teucrium scorodonia* than in *Pisum sativum*, but in no case were the differences very large, and observations made on *Pisum sativum* the variations appear to be due not so much to a concentration of the pigment in the chloroleucites than to increased numbers of the latter.

Further the anatomy of the leaves was investigated and showed marked differences especially in the case of *Teucrium scorodonia*. Leaves of the latter developed in the full light showed a very irregular shape and inconspicuous vascular bundles; when the light was reduced the leaves flattened out, became thinner, and the vascular bundles, especially the mid-rib, became larger and more prominent, with a still greater reduction of light the leaf became very attenuated. In the case of *Pisum sativum* no such differences were observed; the leaf merely got thinner; in both cases the reduction of the palisade cells was remarked, first two to one layers, and finally to none at all.

2) The measurement of the Assimilating-Energy.

This was carried out by placing a leaf in a wide test tube with a known volume of air and carbon dioxide, and measuring the amount of carbon dioxide which was absorbed in a given time (1 to 3 hours according to the rate of assimilation) the results being always expressed as the amount of carbon dioxide absorbed by 1 gm of green leaf in 1 hour; (CO_2 gram). These figures naturally represent the difference between assimilation and respiration, but some preliminary experiments where the latter was determined showed that the difference though smaller was of the same order as a real figure, and could quite well be used to express the variations in the behaviour of the leaves.

The atmosphere used contained about 10 per cent of CO_2 and the tests were carried out on bright days and during the greatest light. Further a constant temperature was ensured by cold water round the test tubes.

3) Assimilating Energy of leaves in the same degree of light intensity that in which they were developed.

Stage in the development of the plant	Cc. of CO ₂ absorbed by 1 gm. of green leaf in 1 hour			
	1st 2 leaves developed	2nd 4 leaves developed	3rd flowering	4th fruiting
<i>Pisum sativum</i>				
developed and tested at ill. II	1.60	1.89	1.88	2.50
" " III	3.82	2.47	2.47	3.47
" " IV	4.08	5.52	4.08	7.38
" " V	6.08	5.23	4.33	8.12
<i>Teucrium scorodonia</i>	4 leaves developed	6 leaves developed	12 leaves developed	
developed and tested at ill. II	2.69	4.82	7.30	—
" " III	6.13	7.00	7.13	—
" " IV	6.01	6.12	7.32	—
" " V	6.90	6.07	7.45	—

From the second stage onward the *Pisum sativum* results may be divided into 2 groups: one consisting of classes IV and V where the plant, using up the slight degree of adaptation it possessed, was able to make up for the reduction of light at the lesser illumination by modifications in its structure and chlorophyll content, and the other consisting of classes II and III where the assimilating energy is definitely lower proportional to the available light. *Teucrium scorodonia*, on the other hand, shows throughout its development a very great adaptability to shade although the high assimilating energy of plants in class II is not developed till the 3rd stage.

4) Assimilating Energy of plants developed under different degrees of light intensity when exposed to direct sunlight.

Stage in the dev. of the plant	Cc of CO ₂ absorbed by 1 gm. of green leaf in 1 hour at ill. I			
	1st 2 leaves developed	2nd 4 leaves developed	3rd flowering	4th fruiting
<i>Pisum sativum</i>				
Plant dev. at ill. II	3.74	1.26	1.17	2.98
" III	4.53	1.45	6.65	4.81
" IV	5.25	3.69	5.36	7.43
" V	6.08	5.23	4.62	8.12
<i>Teucrium scorodonia</i>				
	4 leaves dev.	6 leaves dev.	10 leaves dev.	
Plant dev. at ill. II	4.23	4.51	7.11	—
" III	7.21	8.00	9.24	—
" IV	6.06	6.09	9.38	—
" V	6.90	6.07	7.45	—

Considering first *Pisum sativum*, here again as in the previous cases the classes IV and V ran fairly well together, class III presented considerable fluctuations according to its stage of development, and in the flowering stage actually had a higher assimilating energy than the group IV-V. In class II the assimilating energy was always low. Turning to *Teucrium scorodonia*, the outstanding feature of the table was the high assimilating power of class III which surpasses that of the group IV-V in each stage, while the assimilating energy of class II was also comparatively high especially in the last stage. Thus the conclusion may be drawn that a leaf developed in shade can exhibit a higher assimilating energy in direct sunlight than a leaf developed in sunlight and the writer attributes this to the increased chlorophyll content.

5) Complementary Experiments:

Assimilating Energy of plants developed under different degrees of light intensity when exposed to a low illumination.

CO₂ grain-lw

Plant developed at ill: I	tested at ill. I
" " " V " " " "	" " " " " " " "
" " " II " " " "	" " " " " " " "
" " " V " " " "	" " " " " " " "
" " " III " " " "	" " " " " " " "
" " " V " " " "	" " " " " " " "

The experiments were carried out with adult plants of *Teucrium scottii* and showed that plants developed in full light were at a great advantage when transferred to shade compared to those developed in shade, or in other words emphasised the adaptive modifications which shaded plants had undergone.

The results given under the headings 3) and 4), though not absolutely comparable, would suggest that plants developed in low light intensities use their assimilating energy when transferred to sunlight, and a last case of experiments was planned to see whether the supposition held in the extreme case where leaves of a plant developed in illumination I were tested simultaneously at illuminations I and V:

	CO ₂ gram-hour
Plant developed at I and tested at I	1.99
" " " " " " V	1.11
" " " V " " V	6.00
" " " V " " I	1.04

The results show that when the light intensity is reduced to $\frac{1}{3}$, assimilating energy is very low — i.e. $\frac{1}{3}$ of that of the plant developed and tested in sunlight — but the adaptation has been carried to a point that the leaf is unable to profit by the increased illumination placed in direct sunlight, yet it is more active in illumination I than a leaf developed in illumination V. An analogous effect is obtained when young plants are transferred to increased light intensity and it is probably due partly to lack of protective tissues and partly to deeper respiration depending on the activity of the protoplasm itself.

In conclusion the general results show that plants have the power of modifying their structure and chlorophyll content within their individual limits of adaptability, so that, under natural conditions, their assimilating power tends to remain constant through the different light intensities.

On the Penetration of Different Forms of Nitrogen in Plants: Adsorption Phenomena, Influence of the Nutritive Medium. — CHOUCHAK, D. in *Comptes rendus de l'Académie des Sciences*, Vol. 159, Nos. 22 and 23, pp. 1696-1699 and 784-787. Paris, June 2 and 9, 1913.

The writer shewed in his previous work (1) that the absorption of nitrogen by plants was dependent on the concentration of the solution in contact with their roots, and he then proceeded to extend his investigations regarding the effect of using different compounds of nitrogen. In the course of the experiments it was noticed that the roots of some young plants had been killed by contact with magnesium sulphate had not lost power of absorption; the following trials were therefore planned to distinguish between live and dead roots.

125 wheat seedlings 3 to 4 weeks old were selected and their roots removed; these were carefully washed in distilled water and plunged in 100 c. c. of various solutions containing known quantities of nitrogen. Others which had been killed by immersion for half an hour in boiling water were similarly treated. The equilibrium of the solutions was immediately disturbed and after 10 minutes the roots were removed and the solutions were analysed. The results are given below:

Solutions	NH ₄ Cl		Na NO ₃		Glycocol		Tyrosin	Hydro- cyanic acid
Nitrogen originally present in the solution: mgm.	0.5	1.0	0.5	1.0	0.5	1.0	0.5	0.5
Nitrogen absorbed { by living roots: mgm.	0.091	0.182	0.053	0.105	0.042	0.075	—	—
" dead " " "	0.10	0.20	0.055	0.108	0.075	0.153	0.146	0.04
Nitrogen per kilo of dead roots	11.7	23.4	6.45	12.7	8.8	18.0	17.2	5.1
Nitrogen per litre of the solution at the end of the experiment with dead roots	4.38	8.76	4.8	9.7	4.6	9.2	3.9	5.0
Coefficient of distribution { Concentration in root Concentration in sol.	2.68	2.68	1.34	1.32	1.92	1.95	4.35	1.0

The amount of nitrogen absorbed varies considerably with the nature of the compound in which it is present, and while both live and dead roots absorb approximately equal quantities of nitrogen when presented in the form of ammonium chloride and sodium nitrate, the dead roots absorb a larger quantity when it is presented under the form of glycocol. Further, when the writer compared the amount of nitrogen per unit weight in dead roots and in the liquid which surrounded them at the end of the experiment, he found that the roots were richer in every case, the ratio or coefficient of distribution rising to over 4 in the case of tyrosin. From this he concluded that the nitrogen must have been *adsorbed* by substances contained in the roots. When the roots were transferred to distilled water, adsorbed nitrogen was gradually lost, but whereas the power to fix a fixed quantity seemed unaffected when the roots were replaced in ammonium chloride or sodium nitrate, it was greatly diminished when they were placed in glycocol and tyrosin. Again, by treating the roots with hot alcohol the adsorbing power was attenuated with regard to ammonium chloride but unaffected with regard to sodium nitrate. In the latter case, however, the power was restored by macerating the roots in the alcoholic extract of fresh roots, showing that the adsorbing power, though insoluble in boiling water, must have been dissolved.

For a particular compound the adsorption was proportional to the concentration of the solution in contact with the roots, as shown by the following figures:

Initial concentration, in mgm. per litre	5	25	50	100	200	250
Nitrogen adsorbed, mgm	0.074	0.36	0.74	1.48	2.5	2.75

When these were plotted they formed a curve strictly analogous to that obtained when dealing with the absorption phenomena of live roots.

In the next set of experiments the effect of adding various salts to the nutritive fluid was studied. The dead roots of 75 plants were immersed for minutes in solutions containing 5 mgm. per litre of nitrogen in the form ammonium chloride and 0.4 gm. per litre of each of the salts given below. The live roots of 145 plants were immersed for 70 minutes in solutions containing 0.25 mgm. of nitrogen per litre and 1 gm. per litre of the various salts:

	NH ₄ Cl	NH ₄ Cl + Mg SO ₄	NH ₄ Cl + Na ₂ SO ₄	NH ₄ Cl + Mg Cl ₂	NH ₄ Cl + Ca Cl ₂	NH ₄ Cl + Ca SO ₄	NH ₄ Cl + Na ₂ CO ₃	NH ₄ Cl + Na ₂ Cl
adsorbed by dead roots	100 (0.06 mg.)	0	7.5	23.2	31.5	37.0	42.0	82.0
adsorbed by live roots	100 (0.127 mg.)	8.2	28.0	32.0	48.0	55.0	—	64.5

the case of the live roots it was observed that if the solution were shaken the rate of absorption became constant after 10 to 15 minutes, while in the case of the dead roots some preliminary trials showed that the equilibrium of the solution was not disturbed immediately, as when ammonium chloride was used, but only after a period of time which varied with the nature and concentration of the added salt.

The salts affect both absorption and adsorption, and the figures, though different, run in the same order for the two classes of phenomena, which must be intimately connected with one another. Analogous results were obtained with sodium nitrate, but in this case magnesium sulphate and sodium chloride accelerated instead of retarding the absorption and adsorption phenomena. Where two or more salts were used simultaneously they seemed to modify one another's effect to a certain extent, as shown by the following experiments.

3) That some of the barium occurring in tobacco can be extracted by boiled water and is probably in combination with organic acids.

4) That the occurrence of barium in the live cells of the higher plants suggests that possibly this metal may function in metabolism.

5 - **Chemical Researches on Cacao Seeds.** — REUTTER L. in *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 24, pp. 1842-1844. Paris; June 16, 1913.

The writer has isolated from cacao seeds a white substance formed of microscopic rectangular crystals, soluble in water and to which he has given the name of Cacaorina. This substance which is obtained by the spontaneous crystallization of an alcoholic extract of the seeds treated with dilute methyl alcohol, can be decomposed by hydrolysis into theobromine and Cacao Red, and the latter substance, when treated with water slightly acidified by the addition of sulphuric acid, dissolves in its turn and gives rise to a dexter-rotatory sugar, and a new substance named by the writer, Cacao Brown on account of its colour.

Cacao seeds therefore contain cacaorina, (which, on decomposing, forms theobromine) glucose, cacao red and cacao brown.

5 - **An Unfixable Dwarf Race of Wheat.** — DE VILMORIN, P. in *Journal of Genetics*, Vol. 3, No. 1, pp. 67-76. Cambridge, June 1913.

"Shirno" wheat originated in 1886 from a cross, and has been cultivated ever since at Verrières proving itself a perfectly fixed and stable white variety. In 1902 a dwarf plant was noticed in the population and its ascendance was carefully studied. Seed was annually saved from dwarf plants, but a pure dwarf race has never been isolated, the progeny of such plants consisting always of a mixture of tall and dwarf plants in the proportion of 1 tall to 2 to 3 dwarf. A dwarf red Shirno was obtained as the result of an accidental cross with a red variety and though the colour character became fixed the size character behaved exactly as it did in the white strain. A third example of an unfixable dwarf race was provided by Beseler's Brown Club Head which produced a dwarf in 1905. In all these cases tall plants issuing from dwarf plants have never produced anything but tall descendants.

The phenomenon is somewhat analogous to that of inheritance in yellow mice recently studied by Miss Durham (1) and the evidence points to being a case where the gametes bearing the dominant character may unite but never develop into a new individual, for if there were repulsion between the gametes, with an unlimited supply of pollen, the proportion of dwarf to tall should be 3 to 1 whereas it is nearer 2 to 1. The writer counted the number of grains on the respective ears and found that while the tall averaged 59, the dwarf only averaged 50, but no differences between tall and short were observed, either in germination power or in vigour of the seedlings, indicating that if the theory of a non-viable pure dominant were cor-

rect the death must occur before the seed stage was reached. The non development of the pure dominants would also account for the ration down to tall being always above 2, for where one grain fails in a spikelet, its place is frequently taken by another from the centre of the spikelet which would otherwise remain sterile.

927 - Preliminary Report on Effect of Close and Broad Breeding on Productiveness in Maize. MONROEMERY, E. G. in *Twenty-fifth Annual Report on the Nebraska Agricultural Experiment Station*, pp. 181-190. Lincoln, Nebraska, 1912.

Self fertilization being injurious to maize, the question arises as to whether it is advisable to use a single ear as a foundation stock or whether a number of ears should be crossed in order to maintain the yield. A series of experiments to test the point were begun at the Nebraska Experiment Station in 1909, and the results of the first three years' work, are given in this preliminary report.

The plants are grown under the following conditions :

I. Selfed.

II. Each ear is fertilized by the pollen from 10 to 15 sister plants, but the strain is carried on from year to year by the progeny of one single ear.

III. As II, but the strain is carried on from year to year by sowing a composite sample from 10-15 ears..

IV The plants are detasseled to ensure cross fertilization from another strain ; but as only four strains were originally used in the experiment, these have now lost their identity and the experiment has become a test of detasseled plants.

V. Six ears are selected annually from the best of six rows, and sown the following season, one ear to a row.

VI. Seed is secured each year from a corn crop grown under ordinary field conditions — that is to say that the farmer who produces it was originally provided with pedigree corn and has since saved the best ears of his crop each year for sowing the following season.

The yields obtained in 1911 are given below :

I.	9 90	bushels	(of 56 lbs) per acre
II.	37 66	"	" " "
III.	41 30	"	" " "
IV.	45 89	"	" " "
V.	44 02	"	" " "
VI.	40 70	"	" " "

The results show that all degrees of close breeding between related strains are injurious, for the classes II, III, and IV are beginning to show signs of lack of vigour, which will become more pronounced. As a result of selfing, Class I has already produced several ears which are apparently perfectly pure.

Selection of Maize on the Estate of Ruma in Hungary. — FRISCHMANN,
1885 in *Köszlesek*, Year 23, No. 47, pp. 1694-1697. Budapest, June 21, 1913.

Since 1909 the estate of Ruma (Szerecsény county) has been occupied with improvement of field crops by rational selection. The first work was wheat; maize was taken up later. The variety used was Hersetooth, which has been grown on the estate for a good time, and already, when the selection was begun, showed a number of types, differing both in botanical characters and in time of ripening.

The selection system is divided into two parts:

- 1) Preliminary examination, in which the descendants of the selected plants are submitted to botanical analysis.

- 2) True selection, consisting in rigorous genealogical selection of the types approved at the preliminary examination, and their gradual improvement.

For the first part of the selection, a large number of plants showing desired characters are selected on the field when ripe in autumn. These are brought to the laboratory for botanical examination, and those not approved are discarded; the remainder are registered. All the following plants are considered, both for the parent plants and for their descendants:

Whole plant: height; amount and uniformity of unit yield; precocity; size of the grain cavity in the ear; rapidity of growth; small number of tiller shoots.

Ear: rows straight and close, with at least 14 grains in each; cylindrical form of the ear; proportion of rachis to whole ear — should be less than 14 per cent.

Grains: colour and evenness; 100-grain weight (over 30 gms., and should weigh over 56 lbs. per Imp. bushel); power of germination (should be over 96 per cent).

After this examination, the grains of the parent plants are sown separately in the trial garden for examination of their offspring. The treatment of the garden soil is similar to that given under field conditions, so that the plants undergoing selection may be treated like those from the field.

Only half the grains from each ear are sown (besides which the ones at the end are discarded), the other half being left in the cob till the following year in tin boxes.

The arrangement of the plots is shown on page 1217. It will be seen that grains of each selected ear are sown on three different plots; the number of plants is the same for each. These parallel sowings make the control of the offspring-plants more exact, and show the influence of irregularities in the soil. The results (taking the average of the three plots) obtained by the selection of the first generation give the first indications as to which of the offspring-plants are worth selection. The best of these are then submitted to further selection.

In the first year, all the descendants of the elite types are available. The most perfect of them are chosen to be fresh parents, and the

grains are stored in a tin-box; all this forms the material for the second part of the process.

The stored grains are sown separately on the same plan; but the weakest are eliminated beforehand, on the previous year's results, so that the influence of their pollen on neighbouring ears may be avoided. The multiplication of the élite plants is carried on at the same time on other plots, till they are ready for field cultivation.

If an élite strain is approved by several years' trial, and found free from all faults, it is then submitted to further genealogical selection, with a view to fixing its qualities; for this process, its grain is sown again separately, and once more the best descendants are selected.

From this process the following observations may be drawn:

1) By choice of different types and genealogical selection, élites may be created whose yields differ considerably, and which transmit their characters to their offspring.

2) The different descendants of one parent plant are not of equal value, owing to cross-fertilization. Examples are given by the figures of the élite types 122-1 and 122-2, and those for their parent, obtained in the preliminary selection of 1911 and the first generation following (see Table II).

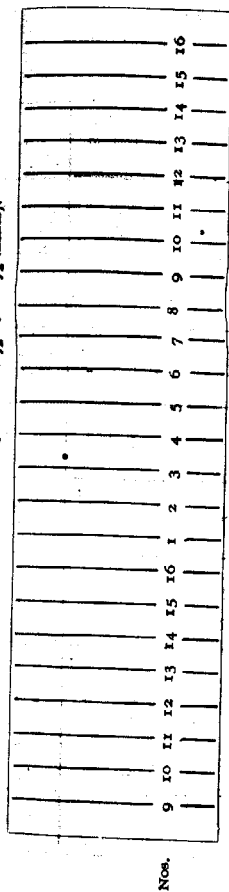
3) From this practical selection the following conclusion may be drawn: as the innate qualities of an ear undergoing selection cannot be recognized for certain, its improvement is not yet fixed in the selected ear of the first generation. Artificial crossing must therefore be used; that is to say, the offspring must be controlled for several successive generations, so that the subsequent selection may be carried out on the most nearly analogous individuals, and the superior qualities of the types recognized as best may be fixed.

This method is illustrated clearly by the genealogical tree of the élite type 122, which was constantly better than the other types chosen. The following is the explanation of the signs used:

- = ear of élite whose grain was divided;
- △ = first filial generation, occupying three rows in the trial garden;
- ▴ = second filial generation, occupying rather over $\frac{1}{4}$ acre ($\frac{1}{4}$ arp.) in the garden;
- = third filial generation, occupying 25 to 50 acres in the field,

This genealogical tree and the tables give a good idea of the system of selection followed at Ruma. Experience has shown that the cross-fertilization between the élite types sown near together does not make appreciable difficulty if they are grouped carefully, keeping apart those with contrasting characters.

(Distance apart of the plants: $28 \frac{1}{2}$ by $16 \frac{1}{2}$ inches).



Path.

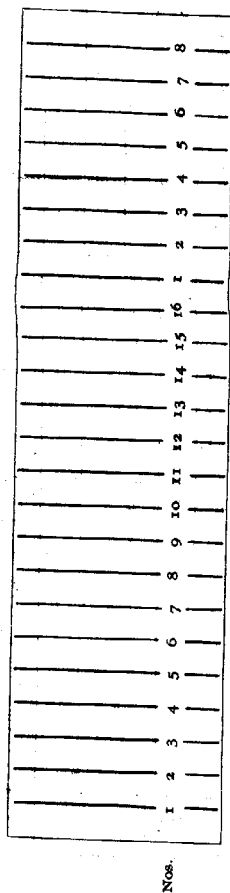
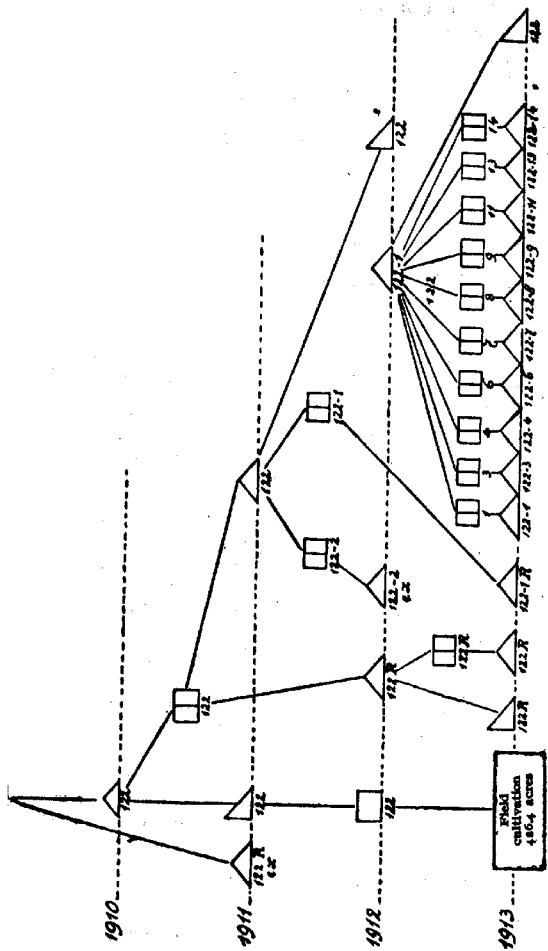


TABLE II. — *Average annual yields.*

No.	Stage of multiplication	Cultivation		Average yields.						Difference of No. 122 in % of average of the group	Remarks
				of the group		of No. 122					
		Place	Area	per plant: gm.	per acre: lbs.	per plant: gm.	per acre: lbs.	per plant: gm.	per acre: lbs.		
122	□	—	—	179	—	190	—	—	—	6.1	First parent plant
122	△	trial garden	3 rows	208	—	249	—	—	—	19.7	Parent plant.
122	□	—	—	242	—	288	—	—	—	19	
R 122	△	trial garden	3 rows	121	—	138	—	—	—	14	Further trial stopped owing to proportion of rachis to ear (16.7 %) being too large.
122	△	trial garden plots garden I.	3 rows	121	—	125	—	—	—	3.3	
122	△		—	—	3690	—	3880	—	—	5.4	
122-1	□		—	195	—	226	—	—	—	15.8	
122-2	□		—	195	—	178	—	—	—	8.7	
122-1	△	trial garden	3 rows	194	—	213	—	—	—	9.7	Discarded.
122-2	△	plots garden II	3	194	—	170	—	—	—	12.3	
122-3	△	plots garden II	3	194	—	209	—	—	—	7.7	
122-4	△	plots garden II	3	—	5250	—	5820	—	—	10.8	



- 929 - **The Inheritance of Certain Forms of Chlorophyll Reduction in (Maize) Leaves.** EMERSON, R. A. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 89-105. Lincoln, Nebraska, 1912.

The writer gives an account of his experiments on variegated maize plants. He found seven different kinds of chlorophyll reduction, graduated from a complete lack of chlorophyll, and apparently also of plastids, to inconspicuous white streak on the leaves. The knowledge of the inheritance of the various forms is still very incomplete. Where the different types have been carefully studied, they have been shown to be Mendelian recessives to normal colouring.

- 930 - **The Inheritance of the Ligule and Auricles of Corn (Maize) Leaves.** EMERSON, R. A. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 81-88, Lincoln, Nebraska, 1912.

A family of maize lacking both ligules and auricles was first noted by the writer in 1910, when 17 descendants of a self-pollinated plant grown the previous year exhibited the peculiarity. The general circumstances indicated that the two characteristics constituted together a single Mendelian factor, which was recessive, and subsequent breeding experiments carefully confirmed the hypothesis. The inside of the sheaths of the ligules of maize were more frequently discoloured as from incipient decay, than normal leaves, which may possibly indicate a useful function of the ligule.

- 931 - **Influence of 'Pickling' on the Germination of Cereals (1)** JOHNSON, J. I. in *Journal of the Board of Agriculture*, Vol. XXII, No. 2, pp. 120-124. London, May 1913.

A series of experiments was carried out at University College, Oxford, using formaldehyde and copper sulphate solutions of different strengths and varying too the period of immersion of the seeds. The germination was carried out in clean sand and no trouble was experienced with mould or parasites of any sort. Some seeds were washed after immersion, while others were not, but this treatment apparently caused no appreciable effect.

Wheat steeped for 15 minutes in a 0.25 per cent solution of formaldehyde germinated 80 per cent and gave the same result when steeped for 5 minutes in a 2 per cent copper sulphate solution. Barley and oats were somewhat more resistant, but the writer recommends in practice 0.125 per cent formaldehyde solution for 15 minutes and 0.5 per cent copper sulphate solution for 12 hours for general use or 1 per cent solution for 6 hours for barley and oats. On comparing the two series of experiments, it was seen that copper sulphate retarded germination about twice as much as formaldehyde.

- 932 - **Quality of Sugar-Beet Seed.** — URBAN, J. (Experiment Station for the Sugar Industry at Prague). *Zeitschrift für Zuckerindustrie in Böhmen*. Year XXXI, Part. 3, pp. 444-448. Prague, June 1913.

As a result of trials made in 1911 and 1912, the writer concludes, in agreement with previous experiments, that beet seeds preserve their vitality for several years; consequently a beet seed whose hereditary tendency is to give rich beets will show this property in any year after

(1) See also No. 797, B. July 1913,

Notes on Pollination and Cross-Fertilization in the Common Rice Plant.
 Macdon, G. P. in *Memoirs of the Department of Agriculture in India, Botanical Series*, Vol. VI, No. 1, pp. 1-10. Calcutta, June 1913.

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A number of the varieties of rice cultivated in the districts of Lower Bengal have been grown on the Dacca farm during the last two years, with the object of studying their character in single plant cultures, and of ascertaining to what extent, if any, natural cross fertilization takes place. References are given to previous work on the subject together with the chief conclusions drawn by other investigators. The single-plant cultures of cross-fertilized plants provided material for studying the inheritance of certain characters. The writer summarizes his conclusions as follows:

"1) In Lower Bengal, under favourable conditions, cross-fertilization takes place in rice to an extent which may be provisionally estimated at about 4 per cent." (This confirms the most recent work of Fruwirth and der Stock).

"2) This cross-fertilization takes place wholly through the agency of insects and would seem to be effective only between flowers of adjacent plants to a radius of a few feet.

"3) As regards certain characters at least, e.g. grain colour, segregation according to Mendelian lines appears to take place.

"4) So long as seed of a variety is kept free from accidental mixture, there is no risk of contamination from cross-fertilization, but if seed gets mixed, cross-fertilization will undoubtedly take place between adjacent plants in a plot, and to an extent sufficient in a few years' time to reduce purity to a number of splitting types. Hence the imperative necessity of taking every precaution to keep seed of varieties free from accidental mixtures."

The Cultivation of Rice with the Help of Machines (1). — F. MAIN in *Journal d'Agriculture Tropicale*, Year 13, No. 143, pp. 129-133. Paris, May 31, 1913.

The writer deals with the experiments carried out in 1912-1913 and conducted by Mr. Alazard, engineer to the Indo-Chinese Rice Growing Commission. The results of these trials were as follows:

The small hand-sower proved satisfactory in spite of the inexperience of native labourers; 0.6 of an acre can be sown in one day, and the rice is sown in small holes in rows 12 to 16 in. apart and 14 in. apart in the

rows. As soon as the grain was up, a marked difference was noted between the rice of the field where the seed had been sown and those where it had been transplanted in the usual native manner. The necessity for sowing on raised land became evident as hoeing was a difficult process on the sub-soil. But whereas the sown rice did not suffer from a sudden rise of water the transplanting operations had to be interrupted. The sown rice came into ear earlier and gave every promise of an excellent yield.

The crop was harvested in two different ways in order to compare the results of transplanting and direct sowing:

1) A reaper and binder was used to collect the crop sown or transplanted on to 1 hect. (2.47 acres) of ploughed land.

2) The crop, sown or transplanted on to 1 hect. of unploughed land was harvested by hand.

The reaper acted as well as the circumstances permitted and Mr. J. Zard deduced the following conclusions from the experiment: Rice sowing should be practised in order to obtain a variety with rigid straw which will not lodge easily, and a grain which will ripen more uniformly.

3) Mechanical harvesting is a very easy operation. A binder will do well, provided its pace is sufficiently rapid. In the Thai Lai ricefield, where the experiments were made, the soil was dry enough to allow of the passage of a four ton tractor. The following are the results of the harvest:

Rice sown on ploughed land	1 tons	16 1/2 cwt. per acre
Rice transplanted on ploughed land	1 "	3 1/2 " "
Rice sown on unploughed land	1 "	4 1/2 " "
Rice transplanted on unploughed land	0 "	15 " "

The above figures show that mechanical cultivation of rice fields already yields positive results, and it will now be necessary to give the soil a better preparation for the crop and to arrange a system of irrigation which will facilitate hoeing operations.

935 - **Manuring of Broom Corn.** — 1. PETRINI I., *La coltivazione della saggina granata nell'agro Fiorentino Pratese*, 67 pp. + 9 figs. Prato 1913. — 2. CARRE, A., *Culture du sorgho à balais dans le Sud-Ouest de la France. La Vie Agricole et Rurale* Year 2, No. 20, pp. 567-570. Paris, April 19, 1913.

The cultivation of broom corn (*Sorghum vulgare* Pers., var.) is becoming increasingly important. This crop is grown particularly in Northern and Central Italy, the South West of France, Turkey, Austria-Hungary and latterly Tunis (1).

The question of the manuring of broom corn is of special importance but has not yet been sufficiently studied. Broom corn is a gross feeder and its period of growth is generally short; it therefore needs a large amount of nutritive material, particularly phosphoric acid and potash in a rapidly assimilable form. According to Prof. Passerini, a crop of 44 bushels of grain and 56 cwt. of straw of common sorghum will take out of an acre of land:

Nitrogen	46.7 lbs.
P ₂ O ₅	63.2 "
Potash	81.4 "

Sig. Petrini undertook experiments on broom corn, particularly on manuring, on a Royal property in the commune of Prato.

The plan and results of the experiments are shown in Table I.

(1) In recent years this crop has also been taken up in North America. — See *The Broom Corn Review*, Wichita, Kansas; also G. MARKS: *Broom Corn*, Agric., New South Wales, *Farmers' Bulletin* No 20 (2nd. ed.), August 12.

TABLE I.

Plot	1	2	3	4	5
sq. yds.	840	840	840	840	840
stances left by previous crop of					
Nitrogen lbs.	10.1	10.1	10.1	10.1	10.1
P ₂ O ₅ . . .	7.25	7.25	7.25	7.25	7.25
Potash . . .	8.5	8.5	8.5	8.5	8.5
Manuring					
Farmyard manure lbs.	3085	3085	3085	3085	3085
Nightsoil . . .	4630	—	—	—	—
Superphosphate . .	—	92.5	92.5	92.5	92.5
Nitrate	—	23	—	23	—
Sulph. of ammonia .	—	—	23	—	23
Sulphate of potash .	—	—	—	20	20
of manuring s-d	16-4	14-9	15-7	16-6	17-0
weight lbs.	9740	8460	9015	8760	8880
Value s-d	33-7	35-6	38-9	35-5	36-4
weight lbs.	473	462	461	419	482
Value s-d	21-7	21-1	2-11	19-2	22-0
stances after crop					
Nitrogen . . . lbs.	+ 56.3	+ 15.6	+ 18.8	+ 17.4	+ 15.9
P ₂ O ₅	+ 6.75	+ 17.9	+ 17.0	+ 16.7	+ 12.5
Potash	+ 3.05	— 4.5	+ 1.95	+ 9.3	+ 2.9

The net gain per acre from the manuring would have been :

	£	s	d
Plot 1	12	16	7
" 2	12	0	5
" 3	11	16	6
" 4	11	4	2
" 5	10	19	2

It should be noted that plots 4 and 5 were under water for some time. These experiments show the great advantage of giving suitable dressings of manures on top of a good organic manuring. The effect of phosphorus is evident; nitrogen gives better results as ammonia than nitrate, though nitrate of soda is of great value if the plants are very young. The advantage from potash is noticeable but not very large.

As a result of these considerations, the writer recommends for broom corn an abundant manuring, particularly to avoid exhaustion of the soil. The best treatment would be a foundation of farmyard manure with a superphosphate, sulphate of ammonia and sulphate of potash.

M. Carré has made manuring experiments on land of moderate fertility in the Haute-Garonne. The yields, calculated per acre are given in Table II.

TABLE II.

Plot	Manuring	Grain		Straw		Total val of crop
		bu.	£ s d	cwt.	£ s d	£ s d
1	Unmanured	50	5 15 6	8 3/4	5 6 0	11 11
2	Farmyard manure, 7 1/2 cub. yds.	68	7 16 9	12	7 4 6	15 11
3	As 2, + 450 lbs. superphosphate at 14 to 16%	72	8 7 0	14 1/2	8 13 6	17 01
4	As 3, + 135 lbs. nitrate of soda	72	8 7 0	14 1/2	8 13 6	17 01

That farmyard manure is valuable is shown by these experiments and the use of nitrate of soda is not necessary except in rainy seasons; phosphatic manure always gives good results to complete the action of farmyard manure, though it may not always increase the weight of the crop, its effect on quality is marked, so that both the grain and the straw fetch higher prices.

In conclusion, it may be stated:

1. The basis of manuring for broom corn should be dung.
2. The necessary element besides is phosphoric acid, which tends specially to improve the quality.
3. Mineral nitrogen and potash may be of use in some cases.

936 - The Development of Cotton Growing in British Possessions. The British Cotton-Growing Association: Eighth Annual Report, pp. 1-36; and, Cotton Growing in the Anglo-Egyptian Sudan, pp. 1-61. Manchester, 1913.

The British Cotton-Growing Association was incorporated for the purpose of developing the cultivation of cotton in the British Possessions. In its 8th Annual Report the Association gives an account of the work done in 1912.

In West Africa, most satisfactory progress is reported from Northern Nigeria (1), and good progress from Lagos, where ultimate success apparently depend on the introduction of high-yielding varieties.

(1) See No 667, B. June 1913.

experiments in the Gold Coast have not been promising and are only continued on a small scale. In British East Africa the experiments in Malawi are being discontinued, but Uganda shows most encouraging results of development, and in Nyasaland the advances made to planters of the Association have largely contributed to the success of cotton in that country; the crop there, though liable to damage by unfavourable weather, undoubtedly undergo considerable extension, especially after the opening of a new railway between Blantyre and the Zambesi. In Rhodesia the Association is discontinuing some of its experiments, which will be carried on by the British South Africa Company, though it continues its advances in Malawi; but no great progress is reported from this country or from South Africa.

In the Anglo-Egyptian Sudan which holds the great promise of future development in cotton cultivation. In January and February 1912 a deputy from the Association visited the Sudan and subsequently presented a report to the Council on the possibilities of cotton growing in that country, the conclusions of which are in complete accord with those of Mr. Armo. In his report presented to the International Federation of Master Spinners' and Manufacturers' Associations (1).

The result of the British Cotton-Growing Association's work has been to show that the chief developments in cotton growing may be expected and that in future will be concentrated on those districts which have shown the best adapted to the crop.

Cotton-Growing Experiments in Sicily in 1912. BARZI, A. in *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year, XII, Series C, Parts 2-3-4, 45-50. Rome. February, March, April 1913.

The writer draws attention to the fact that, owing to the injury caused to bean crops by *Orobancha speciosa*, it is advisable to grow cotton in place of these legumes, and he enumerates the advantages to be obtained by introducing the crop in Sicily. He points out that cotton, cultivated as a summer crop is of great importance in the rotation, for it does not exhaust the land and necessitates repeated hoeings which prepares the soil for the next crop. Further, though cotton does not increase the stock of nitrogen in the soil like beans, it scarcely removes any of this compound; moreover it must not be forgotten that cotton cakes form an excellent cattle feed and may be substituted for summer forage which is very scarce in Sicily. The fertilizing experiments described by the writer were carried out on land belonging to the Colonial Gardens for the purpose of determining the effect of different manures. This land is well adapted to such experiments, the soil, both in its mechanical and chemical composition, is typical of the soils suitable for cotton growing.

The conclusions drawn are as follows:

1. *Manures*, considerably increase vegetative growth, but delay ripening. They are to be recommended in the case of

poor soils, hot climates, and very early varieties of cotton which exhibit more lateral development than growth in height. The soils of Sicily are nowhere poor enough to necessitate the use of nitrogenous manures especially as the latter have a bad effect upon the technical qualities of the lint.

Phosphatic and potassic fertilizers cause the crop to ripen earlier and increase the weight of the lint. Their influence on vegetative growth is negligible compared to that of nitrogenous fertilizers. The crop being so is more easily harvested, and the manures also raise the quality of the lint. Phosphatic compounds are only efficacious if they are applied before the rainy season.

Effect of the different fertilizers upon the technical quality of the lint.

The following table shows that early maturity and high yield are connected with the quality of the lint. Many factors influence these coefficients, upon which the success of cotton-growing depends, viz.: the nature of the soil and climate, the distribution of the rainfall, light intensity, choice of varieties, fertilisers and the time of topping. The improvement of acclimatized varieties and the acclimatization of better varieties depend on all these factors which are, to a certain degree, capable of modification.

The results of the experiments in question only refer to one of these factors; but they allow of rules being drawn up as to the choice of fertilizers.

The effect of the different fertilizers upon the technical qualities of the lint.

Variety	length in mm.			Homogeneity	Colour	Remarks
	Nitrogen	Phosph. Acid	Potash			
Sea Island	33	35	35	good	white	good
Upland 2	24	24	24	"	"	
Sea Island Biancavilla	24	25	24	bad	"	
Mississippi	28	29	28	"	"	
Biancavilla Caravonica	22	26	23	"	"	
Erythrean	24	24	24	fair	"	
Biancavilla Mit-Affi	28	29	28	bad	dirty white	
Simpkin's Early Prolific	18	21	21	fair	white	
Hastrove	23	24	24	"	whitish	at
Horanghied King's	18	20	20	bad	white	
Mit-Affi	25	26	25	good	yellowish-white	at
Caravonica Wool	36	38	37	fair	white	at
Upland No. 12	18	21	21	"		

Agave Leopinassei (Zapupe Vincent).—CALVINO M. in *La Hacienda*. Vol. VIII, Nos. 5-8, pp. 150-153, 182-185; 214-217, 248-250 + figs., Buffalo, N. Y., February-May 1913.

Prof William Trelease, Director of the Botanical Gardens, Saint Louis classified the agaves producing textile fibres (zapupes) as follows.

1. *Agave Zapupe*, blue agave (zapupe azul) or Estopier agave (zapupe Estopier).

2. *A. Endlichiana* ('ixtle' or 'ixtle manso') which grows wild near Istaco.

3. *A. aboriginum* (Zapupe silvestre, cimarron, « de Sierra Chontla) grows wild between Tampico and Vera Cruz and is sometimes vated.

4. *A. Deweyana* ('Zapupe de Tantoyuca', 'Zapupe verde' which has a long vegetative period and large leaves, but the latter are brittle so the variety is not cultivated.

5. *A. Leopinassei* (zapupe Vincent). The natives of the northern part of Vera Cruz and of the districts round Tampico and Tamaulipas have used the fibre of certain agaves from very remote times, but the plant has only been cultivated since 1900. Mr. Estopier was the first to establish cultivation, and he began with blue agave at Tampico. In 1905, a second plantation was established by Mr. Vincent in the island of Juana Ramirez at 30 miles from Tampico in the canal between Tampico and Tuxpan). He also used the blue agave, but not exclusively and part of the plantation was stocked with a green agave which grew wild on the Island (Vincent called it *Agave*). Blue agave had originally been chosen on account of its early maturity and thin fibres, but it subsequently proved to be shorter lived, and was not only deficient in yield but also difficult to extract. The yield of an fibre was only 2.75 per cent, while most agaves give 3 to 3.5 per cent. "Henequen of Yucatan" (*agave rigida*; syn. *A. sisalana*) 4 to 4.5 per cent and Vincent agave 5.5 to 6 per cent. As a result Vincent agave is substituted for the blue variety in the Juana Ramirez plantation.

The following data indicate the agricultural character of the various agaves:

	Age of plant when coming into bearing Years	Age of plant when flowering Years	No. of leaves harvested per annum	Fibre per leaf. oz.
Agave of Yucatan . . .	6-7	14-15	30	1.4
Agave	2 ½	4-5	70	0.5
Agave	3	13-14	80	1.0

And in the next table are given results obtained by Professor L. B. Dewey (in charge of fibre crops investigations, Bureau of Plant Industry, U. S. Department of Agriculture) working on Vincent agave.

Age of leaves	Mean resistance	Resistance per grammé-mètre	Mean yield of fibre per leaf
2 $\frac{1}{2}$ years	1 237.5 gm.	26 107.5 gm.	11.7 gm. (0.4%)
3 "	1 422.0 "	29 329.0 "	15.0 " (0.5%)
8-9 "	1 552.5 "	26 159.0 "	34.2 " (1.2%)

Vincent agave is propagated: 1) by slips or runners which the plants begin to form 11 months after planting out; 2) by means of small bulbs formed on the floral spadix; 3) by seed. The best slips are those 6 to 8 months old and 8 to 12 inches long. Bulbs and seed are first sown in a seed bed, and transplanted after six months in the case of bulbs, and after a year in the case of seedlings. The plant flourishes on sandy marls, but will probably grow well on any soil with good drainage, and will adapt itself to any exposure so long as it is not shaded. It is usually planted in rows 3 feet apart and 3 feet apart in the rows which seems the most suitable spacing, but occasionally the plants are set out on the square 3 or 6 feet apart. By adopting the former method catch crops can be cultivated during the first 10 months and the writer recommends ground nuts (*Arachis hypogaea*) for the purpose. Owing to their sandy nature, the soils on the northern coast of the state of Vera Cruz do not either dry out or become waterlogged during the rainless months, otherwise surface cultivations would be required. The sixth year, that is to say after the 3rd harvest, runners are left between the lines, one for each plant, destined to replace the parent plant when the latter has flowered. Cutting should not begin before the central bud and its surrounding leaves have attained their required length, otherwise the subsequent development of the plant is affected. The crop is harvested all the year round, each plant furnishing 2 cuttings and only those leaves which form an angle greater than 45° with the central bud are removed. At Yucatan it is customary to cut the floral spadix of "henequen" as soon as it attains a length of 18 inches to obtain a greater development of the last leaves, and the writer recommends that similar methods should be employed in the case of the Vincent agave.

Not more than 24 hours should elapse between the time of cutting and the beginning of the extraction process, otherwise the leaves are liable to fermentation and rotting.

The gummy fibre issuing from the defibrating mill is washed in water tanks heated by steam, and then dried, producing fibre

An equal sum must be allowed for freight, commission etc. The sugar is worth 2.7 d. per lb. on the New York market, leaving a net profit 2.1 d. per lb. on the cost of extraction (a lower figure has been taken than the above estimates in order to be on the safe side).

Mishaps in cultivation, fungoid and insect pests are not greatly to be feared in agave plantations: amongst the latter *Geodermis mexicana* ("tuna") and *Stratiolaelaps Julianus* may be mentioned.

939. - Sugar Cane Experiments in British Guiana. — (Agricultural conference, by HARRISON, I. B. and others in *West Indian Bulletin*, Vol. XIII, No. 2, pp. 55-6, Barbados, 1912.

An account of sugar cane manuring experiments carried out at the Botanic Gardens in British Guiana during the 21 years 1891-1912.

The experiments were planned to provide information on the following points.

Questions	No. of replies
A. — Is nitrogen requisite in a sugar-cane manure? . . .	48
B. — Is nitric nitrogen preferable to ammoniacal nitrogen? . . .	24
C. — Is phosphoric acid requisite?	30
D. — Is potash of any use in this soil?	24

The "probable error" due to soil being reduced in the following portions.

	Single plot Probable error per cent	Probable error per cent on average of results Questions.			
		A	B	C	D
1st Crop.	5.4	0.8	1.1	1.0	1.1
2nd. "	7.0	1.0	1.4	1.2	1.4
3rd. "	6.0	0.9	1.2	1.1	1.2
4th. "	10.0	1.4	2.0	1.7	2.0
5th. "	17.8	2.5	3.6	3.1	3.6
6th. "	19.1	2.7	4.0	3.3	4.0

The plots, which numbered 91, were $\frac{1}{25}$ of an acre in area and into two sections. In 1901 another field was divided up into $\frac{1}{20}$ acre each, and in 1910 yet another was laid out into 144 each. Preliminary experiments had shown that planting

feet apart gave a mean yield of 34.2 ± 0.7 tons per acre while rows 4×6 feet apart gave a mean yield of 27.8 ± 0.6 per acre; the former was therefore adopted.

Nitrogenous manuring. The first general result is that nitrogen in the form of sulphate of ammonia, nitrate of soda, nitrate of lime, calcium cyanamide, raw and dissolved guano, and dried blood, exerts a favourable action on the yield of the sugar-cane, and is undoubtedly the manurial constituent which mainly governs the yield of that plant, and this applies to every variety of sugar cane which has been under trial. When nitrogen is applied in dressings not exceeding 40 to 50 lbs per acre there is practically no difference seen in the effects of ammonium sulphate, dissolved guano, and nitrate of soda in normal years; but as a rule the first is considered preferable. Nitrate of lime, cyanamide, dried blood, and raw guano appear to be inferior to these. In the earlier crops of the experiments the best results were obtained by a mixture of one third nitrate of soda and two thirds sulphate of ammonia; but during the latter years this mixture did not prove more successful than did either sulphate of ammonia or nitrate of soda alone. When applied in quantities supplying more than 40 to 50 lbs per acre, dissolved guano and sulphate of ammonia are the best sources of nitrogen for the sugar cane on the alluvial soils of British Guiana, the latter being more economical. The sugar cane makes more effectual use of the nitrogen supplied by 250 lbs. of sulphate of ammonia and by about 300 lbs. of nitrate of soda per acre, than it does of that supplied by heavier dressings. As a whole, dressings of from 2 to 3 cwt. of sulphate of ammonia per acre appear to be the most certainly profitable applications of nitrogen, although in favourable seasons the use of still higher proportions has proved

Mean results of manuring with sulphate of ammonia.

	Series I.	Series II.	Series III.
No. of varieties used	27	11	19
	Tons of canes per acre		
No nitrogen	17.8	13.4	19.1
Low nitrogen (40 lbs. per acre)	23.5	—	—
Normal " (60 " " ")	—	19.8	27.4
High " (80 " " ")	28.1	—	—
" " (90 " " ")	—	23.8	—

*Mean results of manuring with dressings not exceeding 390 lbs.
of sulphate of ammonia: per acre.*

Varieties	Tons of cane for each 10 lb. of nitrogen applied
Demerara 419	2.00
Sculy	1.87
Demerara 625	1.80
" 74	1.62
" 146	1.62
Barbados 147	1.52
" White transparent "	1.50
Demerara 118	1.42
" 3956	1.40
" 130	1.23
Demerara 95	1.18
" 4399	1.17
Bourbon	1.15
Demerara 116	1.12
" 109	0.90
" 208	0.82
" 4397	0.78
" 4395	0.86

*Mean results of comparative manurial trials with sulphate
of ammonia and nitrate of soda.*

No nitrogen	100
Nitrate of soda, 1906-1911, after 14 years of sulphate of ammonia	173 \pm 9.0
Nitrate after 14 years of nitrate of soda	166 \pm 11.0
Sulphate of ammonia, 1905-1911, after 14 years of nitrate of soda	208 \pm 20.8
Sulphate after 14 years of sulphate of ammonia	182 \pm 10.0

*Mean comparative results for different nitrogenous manures 1910-1911
in tons of sugar cane per 10 lbs of manurial nitrogen.*

Manure	tons of cane
Sulphate of ammonia	1.91 \pm 0.23
Nitrate of soda	9.57 \pm 0.29
Nitrate of lime	0.87 \pm 0.25
Cyanamide	0.62 \pm 0.21
Dried blood	0.45 \pm 0.29

Note. — Humidity excessive.

Effects of phosphatic and potassic manures. — The application of phosphate of lime to the sugar cane gives somewhat increased yields with manurings of nitrogen and potash. The increases are high in applications made to plant canes than when added to ripening

of the increases in yields, except perhaps during the first two or three years after the land has been placed under cultivation, are not remunerative. Phosphate of lime appears to be the best form of phosphate to apply on cultivated cane lands which have their subsoil water alkaline. New lands are preferably treated with basic superphosphate, or with basic slag. None of these in our trials having given somewhat the better results. Basic slag is lower in price and hence more economical to use. Mineral dressings to give increased yields must be applied to the soil in such dressings that their use is decidedly unprofitable.

The addition of potash when applied either as sulphate of potash or as chloride, exerted little, if any, effect, the normal weathering of the constituents of the soil setting free for each crop potash in excess of the quantity required for the requirements of the plants. This holds good under all conditions of cultivation, where the greater proportion of potash absorbed by the plants is directly returned to the soil; but where the cane tops are removed from the land, as in nurseries, it is probable that potash exhaustion will take place in the course of a very few crops under the best methods of treatment. The application of molasses gave no decisive results and those obtained with nitro-bacterine were negative.

The use of lime resulted in largely increased yields during the earlier years of the trials, but whether or not its use results in profitable increases depends on the price of sugar. Its action is principally mechanical in improving the texture of the land and it is a question of much importance whether this effect could not be obtained more profitably by the use of roughs or cultivators.

Land fallowed from cane cultivation and allowed to become overgrown with indigenous, largely leguminous, herbage for a period of about 3 years, when in comparison with similar land under continued cultivation, after short periods of bare fallow, a marked improvement in its tilth, and in its contents of humus and combined nitrogen.

Effects of long continued cultivation and application of manures

Land.—The soils of heavy clay sugar-cane-lands of British Guiana are, as a rule, slightly to markedly alkaline in reaction, which accounts for the fact that sulphate of ammonia usually gives better results than does nitrate of soda where these manures are applied in heavy dressings, for it enables nitrogen to take place very readily in the soil during the existence of favorable meteorological conditions. The alkaline state of the soil repletes it with that of the subsoil waters brought up by capillarity during dry seasons, which enables sulphate of ammonia to be used year after year without in the soil by making it sour.

The alkalinity of the soil-waters is increased by cultivation of the land, and by attendant increased plant growth, and by the action of some chemical manures on the soil, so that in the course of long continued cultivation the alkalinity of the capillary water of the soil tends to become excessive, and is not falling off in the crops. The marked alkalinity and the high contents of magnesium and of sodium chloride of the ascending subsoil water are detrimental to growing crops during dry seasons, and may

be the cause of much of the cessation of active growth, of the wilting and of the scorching of crops soon after the commencement of and during the dry season. Where the soil contains much organic matter undergoing active oxidation, the soil-water remains saturated with carbonic acid gas, which retains the salts of lime in solution, thus modifying especially the toxic action of the magnesium salts and the sodium chloride on the plants.

The long-continued use of nitrate of soda in heavy dressings acts detrimentally on the flocculation of the clay in the heavy clay soils and tends to reduce more or less permanently the productivity of the soil. This effect appears to be due to changes in the layers of soil immediately beneath those to which cultural operations usually extend, and may be remedied by frequent and thorough forking of the soil.

The growth of sugar cane without the use of nitrogenous manures is accompanied by marked losses of the combined nitrogen, and of the humus constituents of the soil. Where nitrogenous manures were used, the loss of nitrogen was increased, being somewhat less where nitrate of soda was used than where sulphate of ammonia was applied. The combined nitrogen and the humus constituents which accumulate in the upper layer of the soil during long periods of fallowing suffer great and rapid losses when the soil is put under intensive sugar cane cultivation, and to this loss of available nitrogen is due the marked falling off in the yield which is invariably noticed when successive crops are taken off from either newly cleared or long rested soils. The system followed in British Guiana of manuring with sulphate of ammonia, with or without potash and phosphates, intervening resting or fallowing from cane cultivation during which the soil becomes covered with native herbage, largely leguminous, is one maintained by conservation and possibly increment of the nitrogen of the soil constituents of the soil.

During the first period of the trials there was an apparent loss of about 40 per cent of the phosphoric anhydride of the soil, soluble in 1 per cent citric acid. In the second period, during which greatly improved drainage has been in operation and the tillage has been more perfect, the proportion of phosphoric anhydride soluble in 1 per cent citric acid has increased, and where phosphatic manures have been continuously applied, the proportion of available phosphoric anhydride in the soil has been considerably added to. British Guiana sugar cane soils which contain more than 0.007 per cent of phosphoric anhydride soluble in 1 per cent citric acid solution by 5 hours of continuous shaking, will not as a rule respond to manurings with phosphate, whilst it is doubtful if soils yielding from 0.005 to 0.006 per cent of phosphoric anhydride will benefit by phosphatic manurings; but if the soil yields less than 0.005 per cent, it is advisable to apply heavy dressings of basic slag or lighter ones of superphosphate or of basic superphosphate.

Results prior to 1902 suggested that cultural operations set free from the soil a considerable amount of phosphoric anhydride soluble in 1 per cent citric acid solution to an extent greater than the demands, but the results of the second period do not confirm this, and the potash soluble in 1 per cent citric acid is now less.

inception of the experiments in 1891. The great demands of the cane for potash are met from the reserves in the soil which are not less than 1 per cent citric acid. British Guiana soils which yield 0.006 per cent of potash to 1 per cent citric acid can be regarded as containing, under the present system of cultivation, sufficient available potash for the needs of the sugar cane; if the soil yields from 0.005 to 0.006, it is doubtful if the application of potash salts will result in remunerative returns, but where the yield falls below 0.005 per cent, it is advisable to add potash salts in manures.

The demands of sugar cane for lime as plant food is low, and if the soil up more than 0.006 per cent to 1 per cent citric acid, it will probably supply sufficient plant food for ordinary crops.

The cultivation of sugar cane is accompanied by loss of available lime from the surface soil, so that even if large dressings are applied, it is practically entirely removed in the course of 20 years.

Finally neither improved methods of cultivation, nor liming the land, nor the use of manures, affects the proportion of sugar contained in the sugar

cane. Long continued cultivation tends to ameliorate the texture of heavy soils; the judicious use of natural and artificial manures increases the fertility of the soil, the upper layers of the soil tending to become more friable, but this result is frequently offset by the great reduction of humus matters present in the soil.

Sugar Beet in the Argentine. — DE MARNEFFE, G. in *Journal d'Agriculture pratique*, Vol. 1, No. 21, pp. 657-659. Paris, May 22 1913.

As a result of some trials carried out at Juancho in the province of Buenos Aires a yield of nearly 8 tons of beet per acre was obtained, with an average sugar content of 14.3 per cent. The circumstances were unfavourable to the crop, and it is estimated that the yield could easily be increased to over 13 tons per acre, or in other words that sugar beet crops produced in the Argentine equal both in yield and quality to those raised in France.

Action of Flowers of Sulphur on Sugar-Beets. — URBAN, J. (Experimentation for the Sugar Industry at Prague) in *Zeitschrift für Zuckerindustrie in Böhmen*, Nr. XXXVII, Part 3, pp. 441-444. Prague. June 1913.

His paper gives the results of experiments on adding flowers of sulphur to the soil in the amount of 100 lbs. per acre to rows of sugar-beets. Averages:

	Roots		Juice	
	weight	sugar	polarisation	purity
	gr.	%		
with sulphur (3 rows)	444	20.53	22.56	92.5
without " (")	435	20.60	22.48	92.3

Experiments will be repeated in a different form.

942 - **Remarks on Hop-Growing.** — HIRSH, H. in *Bulletin de la Société d'Économie pour l'Industrie nationale*, Year 118, Vol. 119, No. 3, pp. 685-698, 2 May, 1913.

A review giving an account of the extension of hop cultivation France, Bohemia, Bavaria, England and Belgium. In the case of these countries of production, information is also given regarding the cultivation, harvest, drying and quality of the crops. For Belgium, data have also been collected as to the cost per hectare of growing hops, and on other subjects of economic importance.

943 - **The Horticultural Industry at Ghent.** DUMORTRE, R. in *Revue économique nationale*. Year 10, Vol. II, No 1, pp. 7-28, Brussels, April 15-20, 1913.

The writer first describes the botanic and scientific horticulture of the beginning of the nineteenth century and its representative: The Royal Society of Agriculture and Botany founded in 1808, and then proceeds to give an account of the evolution of this industry.

The collector who cultivated thousands of different species of plants has now given place to the market gardener who grows large quantities of two, or three different kinds of plants. This evolution of horticulture in Ghent, which was complete in 1880, gave rise in that year to a powerful organization, the syndical chamber of Belgian Horticulturists. Although this institution chiefly represents the commercial and practical side of the trade it has shown from the first its firm intention of working harmoniously with the senior association, the Royal Society of Agriculture and Botany. Four years after the creation of the syndical chamber, the two Societies organised, at their joint expense, monthly meetings for the valuation of horticultural products. These periodical meetings have been held without interruption ever since and have become more important every year.

Every five years, they are rendered more attractive by a flower show, whose development is shown by the figures on the next page.

The town of Ghent and its suburbs boast of 720 horticultural establishments, including 5000 greenhouses, and employ over 3000 hands.

In 1837 the value of the total export of plants from Belgium amounted to £60 000 per annum. In 1911, the exports from East Flanders or rather from the neighbourhood of Ghent, to the United States reached the same figure, while the value of the total exports for the same year amounted to £545 356 of which the district of Ghent was responsible for 54.5 %.

In 1912, the worth of the total exports from the district of Ghent alone exceeded £400 000. The principal countries supplied by Belgium are:

Germany to a total value of	£ 164 144 in 1911
France " " " " " " " " " " " "	" 105 307 " "
The United States " " " " " " " " " " " "	" 94 795 " "
England " " " " " " " " " " " "	" 56 391 " "
The Netherlands " " " " " " " " " " " "	" 33 366 " "

Without making any absolute statement on the subject, the writer said that the plants apparently most in request in the United Kingdom

Year	Number of exhibits	Area of exhibition buildings sq. poles	Number of competitions	Number of prizes awarded
1839	3 722	40	20	22
1844	5 200	"	31	59
1852	3 680	"	34	67
1857	3 066	"	50	89
1862	3 688	"	65	124
1868	9 000	120	241	438
1873	11 000	"	291	"
1878	11 500	200	"	457
1883	11 660	200	"	"
1888	12 000	220	417	"
1893	13 960	240	660	"
1898	15 000	270	720	"
1903	15 796	280	670	531
1908	18 000	400	760	"
1913	?	1200	841	1710

is, araucarias, azaleas, begonia tubers, and laurels; while to Russia, especially Moscow, are sent cut flowers, palms, laurels and rhododendrons. Orchids are exported to Paris, Berlin, London, St. Petersburg, Vienna, Rome, Madrid, Amsterdam, Stockholm, Copenhagen etc; new varieties of orchids and aspidistrias find their way to London; and there is a market in Northern France for fruit trees, forest trees etc.

What are the economic factors which have allowed the modern horticultural industry to become, as it is at the present day, one of the first industries in Ghent? The chief factor is incontestably the climate. The town of which Ghent occupies the centre being only 31 miles from the sea, in places below sea-level, enjoys a maritime climate. The dominant west winds are laden with warmth and moisture derived from the Gulf Stream and maintain a relatively uniform temperature. The second factor is the nature of the soil. With the exception of the Escaut and Lys valleys, the soil of Ghent has a sandy permeable soil which allows of azaleas and roses, the two specialities of Ghent being grown in the open ground in October. These plants are placed in beds 5 feet wide, dug

out from 4 $\frac{1}{2}$ to 6 in. and filled in with half-decomposed leaf-mould from neighbouring oak and beech woods. The subsoil furnishes plenty of calcareous water which is an essential in watering azaleas.

The facilities of transport: a network of railways, tramways, highways and canals also assist in the development of this suburban industry.

The fourth and by no means the least important factor is the cheapness of labour in Flanders. The horticultural labourer, without any special training receives an average daily wage of from 2s. to 2s.5 d. Further, the culture in Ghent and the surrounding districts having been a specialised industry for centuries, it has created a class of experienced workers who roughly understand the taking of cuttings and the grafting of azaleas as well as the care of the other local horticultural specialities.

In addition, we should mention that owing to the influence of the Medical Chamber of Belgian Horticulturists a special division known as the Horticultural Office has been created in the Ministry of Agriculture.

944 - **Systems of Pruning Vines, and Distance Apart for Planting.** — J. L. in *Revue de Viticulture*. Nos 1013, 1014, 1015 and 1017; pp. 689-693, 752-756 and 814-819. Paris, May 15, 22 and 29, and June 12, 1913.

The experiments discussed in this article are concerned with vines at Marsville, belonging to the Cognac Vine-growing Station. A vineyard was planted up in 1901 and 1902. The soil is poor and thin, contains 50 per cent. of calcium carbonate. It has received no manure since the vines were planted. Twenty-four different stocks, chosen from those best suited to calcareous soils, are each represented by a square 100 vines. *Rupestris du Lot* is taken as a control at eight different places thus forming eight plots of 100 each.

Half of each plot is grafted with Folle Blanche, the other half with Colombard; the first variety is a weak grower and generally grafts badly while the second binds much better with most stocks.

Each of the two grafted varieties is pruned and trained in three different ways: 1) in the shape of a vase, with props; 2) on Guyot's system on wires; 3) on Royat's system, a simple cordon, also on wires. The vintage is weighed every year according to the stock, the system of pruning and the variety grafted on; the density of the must is determined in the same way. At pruning, the weight of the canes is also determined in each class.

Systems of pruning. — The most striking point shown by the writer's investigations is that for the climate of the Charente departments, cutting with long canes gives the heaviest yields, and at the same time hardly affects the quality of the wine or the vigour of the vine. Thus his experiments Royat cordons give much better yields than vases; they are also better than Guyots with Folle Blanche and equal with Colombard, whose lowest buds are liable to bear little fruit. The sugar content of the grapes is decidedly higher on cordons than on Guyots, with the exception of the first vintage. This comparison cannot be made with vases, as they give so much less; but looking at the average vintage weights, only

the figures for the vases are very near those for the Royat pruning; the must of the latter is denser than that of the former. Lastly, with the cordons, which began by being the least, eventually gives the general average; it is well above that of the Guyot system with the varieties; it is also above the vases with Colombars, and about with Folle Blanche, in spite of the yield of grapes being three times as much.

Regarding special requirements of particular varieties, the conclusion holds for the Charentes should do also for other regions of similar soil that is moist, with considerable atmospheric humidity, and with attention from the leaves not too intense (Centre and East), and where there is no hurry in ripening the grapes; pruning for long canes ought to be used in such regions. It appears to be so in Champagne. The same may be true for places in which moisture of the soil can compensate for the more or less dry state of the air (plains and valleys). In the case of most drought-resistant stocks place the grafts which they bear under the conditions they would have in moist soil on stocks requiring moisture. It is with these that the best results from long canes may be expected.

In the case of Guyot pruning and the other types which may be classed with it, the vines suffer less from lack of moisture; but all the same Chanzit and have also had better results with cordons than with Guyots in poor soil in the South, where the air is also dry.

If there is no doubt that the vase is the system which exposes the vines least to drought. Provided a sufficient number of eyes are left, the stem can give good yields like the other two.

Lastly, in vineyards producing fine wines, where quality is all-important, cutting with long canes is greatly preferable to leaving a lot of wood.

The first will give a larger yield of equal quality, or if the yield is not so high, the quality will be very much higher. The more the vintage can be made, the more true does this become.

Season of planting. — The deductions to be drawn from the first experiments at Marsville on this subject are here given.

The distance apart for planting should be determined in practice by consideration of the moisture conditions of both soil and air; further the distance between the rows should as far as possible be made convenient for the use of implements and teams to be used. The distance between the vines in the rows will be the most variable factor, and will allow a fair concordance between physiological requirements and practice. Close planting, at less than 3 ft. 3 in. \times 3 ft. 3 in., is to be condemned outright, as far as the expenses show at present, at any rate for the soil and climate of the Charentes. A distance of 3 ft. 3 in. \times 3 ft. 3 in. square, though so far very productive, suffers from drought, and sometimes also from grey-rot: it is apparently not to be recommended. It also appears that distances of 6 ft. 6 in. \times 5 ft. are too wide; they do not give a maximum total yield. Between these limits, the experiments here described cannot yet furnish precise indications; but the results of planting about 1800 stocks to the acre seems to be sound.

Name or No. of stock	Weight of prunings per vine. Av. of the three pruning methods	Order according to weight of produce	Weight of prunings per vine Av. of the three methods	Order according to vigour of growth
	lbs.		lbs.	
Rupestis du Lot	2.32	23	1.13	9
34 B. M.	2.51	20	1.24	3
440 B.	2.81	15	0.98	20
41 B.	3.46	4	1.10	10
1402	2.59	18	1.19	5
Aramon X Rupestis Gansin No. 2	2.78	16	1.31	2
Aramon X Rupestis Gansin No. 1	4.63	1	1.36	1
3306	3.23	9	1.03	14
3309	3.32	8	0.95	21
Berlandieri Rességner No. 1	3.04	11	1.20	4
Berlandieri Rességner No. 2	2.60	17	1.02	16
81-2	2.42	21	0.71	24
161-49	3.10	10	1.08	11
Gamay Goudere	2.85	14	1.19	6
420-A	3.35	6	0.86	22
301-64	3.38	5	1.14	8
301-37	3.01	12	1.08	13
101-14	2.34	22	0.98	18
17-37	2.56	19	1.02	15
Berlandieri d'Angac	3.32	7	1.08	12
Berlandieri Lafont No. 9	2.88	13	0.98	19
33 A	3.60	3	1.17	7
554-5	3.63	2	1.00	17
157-11	1.47	24	0.74	23

Stocks for calcareous soils. — The 24 stocks used for the experiment were chosen from the best known at the time of planting. The general averages of the figures obtained during the seven years of the experiments are given on the preceding page.

Making a classification of the best bearers which are also strong growers, we have, in order of merit: I, Aramon X Rupestris Ganzin No. 1; II, 33 A; III, 41 B; IV 301-64, all among the first five for heavy cropping and also among the first ten for growth of wood. Then: V, Berlandieri d'Angéac, and VI, 161-49, which are 7th and 10th for yield of fruit and 12th and 11th for weight of shoots. Lastly: VII would be Berlandieri-Rességuier No. 1, 11th for fruit but 4th for growth. The first five all have an average yield per vine of more than 3 ¼ lbs., the highest reaching 4 ½ lbs; the 6th and 7th only reach 3 lbs.

Examination of the series of yearly figures for weight of shoots shows that these stocks keep up their growth admirably and keep on bearing; none of them shows any falling off.

Besides these first class ones, there are other good bearers, which are rather lacking in vigour of growth, at any rate in this unmanured soil. Such are: 554-5 and 420 A, which show no tendency to exhaustion; 3306 and 3309, which are subject to chlorosis; 301-37, a heavy bearer, but quite gone off as a result of chlorosis; Berlandieri Lafont No. 9, a fairly good cropper; Berlandieri-Rességuier No. 2, here not as good as No. 1, though generally considered superior to it; 420 B, which seemed at first better than 420 A in this vineyard, but now bears much less, though its growth is about the same; Gamay Couderc, vigorous and fruiting fairly well.

It is interesting to note that 41 B, which is widely grown on calcareous land in the Charentes and elsewhere, has maintained its excellent reputation in these exact experiments; and, indeed, without manure in a not very fertile soil.

Folle Blanche and Colombard. — In these experiments Colombard has turned out better than Folle-Blanche, which is not in agreement with the general opinion.

945 — *The Oberlin Vine Hybrids: their Value and Use.* — ROY-CHEVRIER, J. in *La Vie agricole et rurale*, Year 2, No. 27, pp. 6-10, figs. 1-6. Paris, June 7, 1913.

M. Oberlin, Director of the Vine-growing Institute at Colmar, many years ago obtained some very remarkable direct bearers by crossing the Gamays and Pinots with Riparia. The writer has grown some twenty of these varieties and has also made tests of their wine; so long ago as 1894 he was able to state that some of these Riparia hybrids of which the best bearers are Oberlin 595, 604, 605 and 716, were resistant to phylloxera; his is still the case at present, and they are also highly resistant to fungus diseases; further, their wine is of unusual composition and very rich containing 15 to 17° of alcohol, with a correspondingly high figure for total acidity.

Direct bearers, easy to propagate, very resistant to phylloxera and fungus diseases, and thriving under varying conditions (Nos. 604 and 605 can stand high lime content), have a great value for mixed farms in which

field work may interfere with the care of the vineyard. Further, their rapid flowering, never hindered by the bunch mildew, keeps them free from the first generation of *Conchylls*. But their chief merit is their remarkably early ripening, which takes place at the same time as with the Early Vosge Gamay or even before it; further, in spite of the unsettled weather to which the vines in the cold East region are exposed, the Oberlin hybrids always give a highly alcoholic wine, owing to the perfect ripeness of their grapes. Contrary to the general rule that acidity decreases with increase of sugar, in these grapes the two reach a maximum together. Thus No. 595 often passes 17° of possible alcohol with 9 gms. of acid calculated as sulphuric acid; 604 reaches 15° of alcohol and 8 gms. of acid; 605, 16° and 9 gms., and 776, which had more than 15° of alcohol, retains 13.6 gms. of acid. The value of the Oberlin is therefore in getting a full and alcoholic wine without expense and trouble.

The only fault to be found with these vines is their low yield; the small grapes full of pips, of their rather loose bunches, often give up their juice with difficulty. Further, these very vigorous hybrids, of almost a wild nature, require a tree-like growth on trellises, or at any rate an extension of the cordons, to bring out their inherent fertility. Training as horizontal cordons with double spurs is considered by Oberlin and the writer as the best means of treating them.

Planting should be in deep and rested soil, in quincunx, at 16 ft. in the rows and 4 ft. 6 in. between the rows. Each cordon thus occupies about 8 1/2 sq. yds. which means not quite 600 per acre.

The second season only two shoots are left; the third season the better of these is trained onto the wire at 20 ins. from the ground, but to save tying it is simply twisted round it. The fourth season this young cordon is cut with single spurs, and is carried further along the wire. The fifth season the single spurs are changed to double ones, except on the prolongation of the cordon (which should now reach to the next vine), where they are left single. By the sixth or seventh season, according to the strength of the shoots, the cordon is established all the way along, and can be pruned with double spurs from one end to the other. The double spur is easy to deal with: one of the spurs has two eyes and the other four; at the next pruning the four-eyed spur is cut back and the shoots of the two-eyed spur supply the two new spurs, and so on. The spur may always be renewed on the cordon, as the Riparia hybrids keep on breaking from the old wood.

The advantage of the double over the single spur is obvious: the single one, having two eyes, will generally bear four bunches; the double, with six eyes may have as many as twelve bunches giving three times the crop.

On this method, the Oberlin hybrids have given high yields as curiously enough without any impoverishing of the constitutional richness of their wine.

Fruit Production and Trade in Hungary in 1911.— Extract from the Report of the Statistical Year Book on the Work of the Government in *Volkswirtschaftliche Mittheilungen aus Ungarn*, Year VIII, Part V, pp. 517-520. Budapest, May 1913.

The climatic conditions of 1911 having in the main been favourable to the fruit harvest, the results obtained from most kinds of fruit trees were better than in 1910. The data on exportation are satisfactory: the quantities exported tend to increase whilst those imported diminish. The great decrease of importation in 1911 is not accompanied by a corresponding decrease in value, on account of the rise in prices of some kinds of fruit; the contrary whilst the importation in 1910 represented a value of £38 600. That of 1911 amounted to £356 443. On the other hand with the quantity of the fruit exported in 1911 the value also increases and reaches £38 310 whilst all the exports of fruit in 1910 attained only £566 978. The annexed table shows the quantities and values of fruits imported and exported during the period 1909-1911.

The greatest part of the Hungarian fruit trade is with Austria; thus 507 400 cwt imported in 1911, 193 700 (38.2 per cent of the total import) came from Austria and of the 1 500 578 cwt. exported, 1 024 040 cwt. went to Austria. After Austria comes Serbia; that country exported into Hungary 3 670 cwt. of fruit (33.4 per cent. of the total imports). 65 601 cwt. (1.9 per cent.) were imported from Bosnia, 48 720 cwt (9.5 per cent.) from Italy, whilst only 11 751 cwt. (2.3 per cent.) came from Rumania, 6522 cwt (1.3 per cent.) from Turkey in Asia and 5119 cwt (1. per cent.) from Turkey in Europe.

Of the fruit imported from Austria 71.9 per cent. consisted of apples and pears, 7.9 per cent. of juniper berries, 4.2 per cent. cherries and egg-foots. Among the fruit imported from Bosnia 46.6 per cent. were dried plums, 1.1 per cent. fresh plums, 10.8 per cent. walnuts. In the imports from Italy, 69.3 per cent. were apples and pears, 17.3 per cent. fresh plums and 8.6 per cent. dried plums. From Italy the chief fruit imports were apples, pears, and juniper berries; from Rumania walnuts and prunes; from Turkey in Europe walnuts and from Turkey in Asia walnuts and hazelnuts.

Among the purchasers of fruit exported from Hungary, Germany comes first and Austria. In 1911 Hungary sent to Germany 425 287 cwt. (28.3 per cent.) and to the United States which come next only 8273 cwt. Of the fruit exported to Austria the percentage was the following: 23.7 apples, 21.1 cherries, 12.4 cherries and egg-foots, 6. apricots. To Germany the exportation was chiefly apples (84.3 per cent.) and fresh plums (7.2 per cent.) whilst to North America it was especially walnuts.

	Weight			Value		
	1909	1910	1911	1909	1910	1911
	cwt	cwt	cwt	£	£	£
Apples, Pears, Quinces	636 144	351 693	209 203	222 561	134 575	127 671
Fresh plums	146 194	98 524	51 158	21 610	21 927	16 291
Apricots	1 480	638	348	1 031	912	411
Cherries, Egrigots, Fresh Peaches	29 197	15 815	15 526	20 341	13 799	12 291
Fresh Melons	7 671	4 843	3 414	3 489	2 260	1 141
Other Fresh Fruits	5 072	4 572	6 370	2 577	2 260	3 591
Juniper berries	12 074	15 712	31 252	6 423	6 780	19 441
Dried plums	122 256	41 281	49 397	49 445	44 132	64 121
Other dried fruits	6 402	3 962	2 393	4 362	2 379	2 691
Fresh grapes	12 290	8 657	8 718	6 820	7 216	9 121
Walnuts	49 611	40 472	29 298	36 796	41 594	31 841
Hazelnuts	12 286	19 139	19 322	32 915	60 944	68 001
Total	1 040 678	605 308	507 400	412 370	338 778	356 541

Exports.

	cwt	cwt	cwt	£	£	£
Apples, Pears, Quinces	151 064	106 912	638 638	70 103	52 696	204 061
Fresh Plums	90 699	292 093	217 667	29 183	96 629	98 121
Apricots	172 377	34 604	71 867	93 259	44 568	90 141
Cherries, Egrigots, fresh Peaches	105 701	47 974	140 488	61 499	33 180	77 641
Fresh Melons	79 466	68 508	79 987	21 491	18 200	24 591
Other fresh fruits	38 580	47 488	47 265	19 389	30 254	31 261
Juniper berries	19 131	15 474	4 757	10 190	6 741	2 591
Dried plums	18 030	12 991	13 304	11 816	14 592	17 801
Other dried fruit	5 550	9 820	9 895	3 925	6 582	8 751
Raisins	201 643	155 590	221 451	139 809	147 462	201 141
Walnuts	23 573	57 403	54 504	23 949	114 710	108 141
Hazelnuts	256	1 098	755 71	317	1 507	1 181
Total	901 071	850 754	1 500 578	484 930	567 141	866 771

Bananas, Their Cultivation and Utilization. Trade in Banana Products. Classification of the Genus *Musa*. — WILDERMAN, E. de in *Annales du Musée Colonial de Marseille* 1912. Extract, Editor Chaillemel, Paris 1913.

Bananas are not yet sufficiently, well understood both from the scientific from the economic points of view. Great confusion prevails as regards systemization of the genus *Musa*, although few plants are capable of doing as much valuable produce on a small space and with little attention, the banana. Dr Zagorodsky (1) mentions the following amongst the fruits of the fruit bearing banana.

1) Fresh fruit for export; (2) Dried fruits; (3) and (4) Preserved and salted bananas; 5) Banana starch and flour; 6) Sagù, 7) a substitute coffee; 8) a substitute for rubber; 9) liqueurs, alcohol, wine, beer, vinegar etc; 10) a cattle feed. To complete this list it should be added that bananas, furnish a fibre extracted from their leaf-sheaths and leaves, this has not yet been studied systematically.

It appears to the writer that the time has now come to turn to betterment this fruit which is so easily grown in the Tropics and always consumed in increasing quantities in Europe. A rapid survey of the statistics banana export and consumption suffices to prove the truth of this statement. The importation of bananas into Germany increased tenfold between 1906 and 1910. Seven or eight years ago, France and England consumed respectively between 50 and 60 thousand and 2 million bunches of bananas. Now, on the other hand, from 150 to 200 thousand are sent to us, while millions are consumed in England. The United States of America alone take 40 millions of bunches worth £ 2 500 000 and America exports fruit to Europe to the value of :

£ 1 600 000	Great Britain
» 200 000	Germany
» 100 000	France

Jamaica, Barbados, Domingo and Costa Rica have immense plantations still bearing. In 1909, Jamaica exported 16 712 210 bunches of bananas, the area occupied by plantations in 1909-1910 was 69 000 acres. Costa Rica has become a great centre of production and 100 000 acres capable of yielding from 700 000 to 12 000 000 bunches monthly have been devoted to this crop.

The writer, after having given some information respecting the application of cold storage methods to banana transport, and the most important method of manuring the soil (2), deals with the diseases and noxious insects which attack the banana tree and with the industry of banana drying. Then enquires which is the best variety for propagation and how it is recognized. These queries are difficult to answer for the lack of two

(1) Dr. M. Zagorodsky. Die Banane und ihre Verwertung als Futtermittel. Supplement to *Tropenpflanzer*, XII, 4, 1911.

(2) *S. No. 1278 B September 1912.*

things: 1) a satisfactory classification of the genus *Musa* and 2) a reliable basis of information which would throw some light upon the economics of banana culture. In the hopes of collecting some information which will lead to a rational solution of the problems the writer proposes to draw up a circular letter embracing the following list of questions.

Enquiry concerning Bananas.

Locality. — Climatic and geographical conditions, and the geological origin of the soil suitable to the plant.

Habit of the plant:

Presence and absence of a species of bulb.

Height, thickness and colour of the stem.

Colour of the cellular sap of the sheaths which form the stem.

Length, width and terminal form of the leaves. Colour of the leaves on upper and lower surfaces.

Colour of the mid-ribs.

Colour of the cellular sap of the leaves.

Resistance to wind, persistence of the leaves or total disappearance in winter.

Form of inflorescence:

Inflorescence bracts, their size and colour. Number of « hands » per inflorescence.

Number of flowers, or fruits, per « hand ».

Is the number constant for the whole inflorescence? It would be useful to add to the data of this enquiry samples of flowers and of fruit; the flowers should be dried or preserved in alcohol, or formalin; the fruits preserved in formalin. In the case of fruits containing seeds, it would be interesting to include samples for purposes of study.

It would be well to send with the above samples, drawings and photographs referring to all the questions of the enquiry.

To those persons who are able to carry the enquiry further, it is suggested that they should furnish additional information with regard to the botanical characters, i. e.:

Flowers:

Their colour and length. Perianth: number of lobes and their shape; stamens: number; anthers: colour and length; styles: length, colour.

Fruit:

Shape, colour and size when ripe. Seeded or seedless.

Colour and flavour of the pulp.

Seeds:

Colour, shape, size, state of the epidermis, germination.

Uses:

Unripe, ripe, and preserved fruits, fibre, pith, or central portion, use of rachis.

Various:

Native names; cultivation and diseases; industrial and economic use of the different parts; trade and statistics.

- **Export of Shoots of Date-Bearing Palms.** — TRABUT L. in *Bulletin Agricole de l'Algérie et de la Tunisie*, Year 19. No. 9 pp. 185-187. Algiers. May 1, 1913.

The introduction of date culture into the desert regions of the Western United States of America has given rise to a large importation of shoots, «djebars», from the oases of north Africa. For some years, Algeria has exported annually from 8 to 10 thousand «djebars», and the Algerian planters have become apprehensive of future competition, and alarmed at the rise in price of the necessary shoots for their own plantations.

The writer draws attention to the fact that competition is inevitable and that the rise in price of which the colonists complain is not excessive. Further since it is to be foreseen that for a considerable time it will be possible to supply «djebars» of the Deglet Nur variety at about 4s. each, it would be better to cultivate this variety specially for the production of shoots. To this end he advises that the latter should be carefully selected, planted in series and frequently watered; and after three years there should be 5 or 8 shoots round each parent plant; 800 cuttings or even more under suitable conditions may be planted per acre and would prove more remunerative than the production of dates.

The writer mentions other good varieties for export: 1. The Tafilalet date, called «Medjoul», which the Department of Agriculture at Washington buys at the rate of £2 per guaranteed «djebar». The fruits are large and little known on the French markets, being sent to Tangiers and London. In Tangiers, the average price is 200 francs per 100 kilos. (£4 0s 7d per cwt.) 2. The Manakor variety from Djerid also called the Bey's date. The fruit is excellent, and the variety should be propagated at present, it is still rare and as the old palms do not yield shoots, it is therefore necessary to obtain seeds. This is being done, and the variety proves to be fairly constant from seed especially in the Djerid oasis, where good rains are to be found.

The progress due to the work of the American Experiment Stations will certainly have a good influence also upon the North coast of Africa, where the cultivation of the date palm has been considered as fixed by the practice of centuries.

9 - **Management of the State Forests in Bavaria.** — ENDRES, in *Forstwissenschaftliches Centralblatt*, Year XXXV, No. 6, pp. 289-296, Berlin, June 1913.

Owing to legislative measures and to the work of the Bavarian Forest Administration, it is possible to give an account of the total production of the Bavarian State Forests of the 4-year period 1908-1911, compared with the year period 1903-1907, but details of the principal and by-products cannot be given as official statistics in these matters are no longer collected.

Total Production.

	1903-1907 (mean)	1908	1909	1910	1911
Total forest area . . ac.	2 060 699	2 018 136	2 019 499	2 016 832	2 019 68
Total volume . cu. ft.	132 968 060	144 694 000	168 780 000	167 367 000	172 821 00
" " (relative)	100	109	127	126	130
Volume per acre cu. ft.	64.5	71.6	83.5	83.0	85.6
Surplus compared with 1903-1907:					
total . . . cu. ft.	—	11 726 000	35 812 000	34 399 000	39 853 00
per ac. . . " "	—	5.8	17.7	17.0	19.7
Timber more than 2.7 in. in diam:					
total . . . cu. ft.	115 133 000	125 129 000	147 695 000	144 636 000	152 816 00
" " (relative) . .	100	109	128	127	133
per ac. . . cu. ft.	55.9	62.0	73.1	71.7	75.6
Surplus:					
total . . . cu. ft.	—	9 921 000	32 562 000	31 502 000	35 554 00
per acre . . . " "	—	4.9	16.1	15.2	17.6
Total receipts . . . £	2 024 856	2 428 899	2 776 527	2 837 289	3 024 6
Mean " per cu. ft. in pence.	3.65 d	4.0 d	3.9 d	4.0 d	4.1 d
Do. (relative)	100	110	108	111	115

From the data given the following facts become evident :

I. That the production of timber is greater owing partly to increased cutting of coniferous trees and partly to better management.

II. That prices of timber have risen (8 per cent from 1903-10 to 1911).

III. That there is a slight gradual fall in prices for firewood during last few years, this will only rise again with the decreasing purchasing power of money as the relation between the increase of population and demand for firewood is undoubtedly declining.

Timber.

	1903-1907 Mean	1908	1909	1910	1911
..... cu.ft.	59 403 000	68 586 000	82 808 000	84 019 000	92 636 000
(tive)	100	115	139	141	156
cre. cu.ft.	28.8	34.0	41.0	41.6	45.6
nt of total production	44.7	47.4	47.0	50.1	53.6
the timber more					
n 2.7 in. in diam. .	51.6	54.7	56.1	57.3	60.6
surplus:					
..... cu.ft.	—	9 182 000	23 415 000	24 510 000	33 235 000
re. "	—	4.5	11.6	12.1	16.4
oniferous wood:					
..... cu.ft.	52 446 000	60 992 000	74 385 000	76 673 000	84 337 000
(relative)	100	117	142	146	161
timber.	88.4	89.0	89.7	91.3	91.1
broad leaved wood:					
..... cu.ft.	6 922 000	7 593 000	8 441 000	7 275 000	8 335 000
(relative)	100	109	122	105	120
timber.	11.6	11.0	10.3	8.7	8.9
..... cu.ft.	3 164 000	3 224 000	3 681 000	3 111 000	3 426 000
receipts for timber £	1 508 833	1 715 883	1 974 073	2 084 828	3 369 816
receipts per					
ft. pence	5.7	6.0	5.7	6.0	6.1
relative)	100	105	100	105	108

Firewood.

	1903-1907 Mean	1908	1909	1910	1911
..... cu.ft.	73 565 000	76 108 000	85 962 000	83 419 000	80 205 000
(tive)	100	103	117	113	109
cre. cu.ft.	35.7	37.7	42.5	41.3	39.7
is. "	—	2 543 000	12 043 000	9 853 000	6 640 000
receipts. £	615 893	715 015	802 453	752 460	709 285
" per cu. ft. . pence	2.0	2.2	2.2	2.1	2.1
relative)	100	113	112	108	106

950 - Prize Competition for the Encouragement of Afforestation in Hungary. — Official communication in *Erdészeti Lapok*, Year III, Part XI, pp. 502-504, Budapest, June 1913.

Paragraph 165 of the forest law XXXI of 1879 deals with the afforestation of arid land, land worn into gullies, and shifting sand; this work is of great economic importance, and to encourage such planting in 1913 the Minister of Agriculture has organized a prize competition, the prize being supplied from the national forest fund. They will be as follows:

Eleven "grands prix" of £40, £32 and £24 for areas of at least 25 arpents (35 acres).

Ten first-class awards of £20 and £16 for areas of at least 10 arpents (14 acres).

Nine second-class awards of £12 and £8 for areas of at least 5 arpents (7 acres).

The following will be eligible for these prizes: 1) landowners who have undertaken afforestation of the above-named types of land, in the spring or the autumn of 1913, without State subventions; 2) those who, with State assistance, have undertaken this work under conditions of exceptional difficulty, and with unusual care and success, thus benefiting the public more than themselves.

Competitors must undertake the whole of the afforestation work as laid down in paragraphs 2 and 4 of the forest law cited. The plantations admitted to the competition will be judged in 1918. The competitor will not be eligible for a prize unless the plantation is still in his possession at the time when the prizes are awarded.

Inscription of planting carried out in the spring will be received up to the end of July, that of autumn planting to the 25th of December; it should be addressed to the Public Forest Administration Committee or to the Royal Forest Inspectorate. Such inscription should include a detailed description of the place and give the area afforested and an exact enumeration of the species of trees used.

LIVE STOCK AND BREEDING.

951 - The Campaign against Flies. — *BAUWERKER in Zeitschrift für Gestiühnwesen und Pflanzenschutz*, Vol. VIII, Part 6, pp. 121-129. Hanover, June 1913.

Flies are often a real pest to man and domestic animals, especially when they invade stables. The importance of the destruction of flies has even been the subject of a discussion by the Budget Commission of the Prussian Chamber of Deputies, in connection with the removal of the thoroughbred stud from Graditz to Straussfurt, the latter place being infested with flies.

The reasons for destroying these persistent and dangerous insects are well known, and many methods of destruction have been devised, but the writer considers that appreciable and durable results can only

trained by giving up half measures and undertaking an energetic and systematic campaign. Considering the importance of the question, he sought well to give an account of the methods he has used in the stud in his direction at Eichelscheiderhof, as the results have been very satisfactory. In 1887 when he undertook the direction, the stud was so badly

infested by flies that living there was most disagreeable in summer. He began by hanging up in the stables and all dwellings, without exception, pieces of limed wood, bigger and longer for the stables, thinner and shorter for the houses. For some time the flies had to be removed and the wood re-limed every day; but when the flies were somewhat reduced this was done only every two or three days. In the earlier years the cost of lime was considerable (£ 4 to £ 4 10s), but it soon diminished considerably.

Various other means were employed. Further, the general conditions were much improved by the drainage of the land round the stud farm, which was rather marshy and provided excellent conditions for flies to breed. A benefit was also derived from scrupulous cleanliness throughout the stud, including disinfection of closets and cess-pools, and ventilation of the stables. Flies dislike draughts, whereas the animals, being accustomed to open air when quite young, do not take any ill effects from

the flies were also destroyed in places where they like to assemble; for example, number were burnt by spirit lamps, being collected at the approach of a person on the ceiling and walls of the kitchens; in this way many eggs were destroyed before they had time to develop. It was found that whitewashing with a sprayer was an excellent means of destroying the eggs; this was still better when a little formalin was added to the milk of lime. For disinfection, a strength of 2 or 3 per cent. was used; but 1 per cent. does the same for ordinary purposes.

Formalin is an excellent fly-poison. The writer had good results with it. He got from a paper: this consists in setting out on a plate small pieces of bread soaked in a pint of milk to which two spoonfuls of formalin have been added. A pint was found to be enough for large spaces, such as stables; while for smaller places, such as dwelling-rooms, half a pint is sufficient.

During the campaign undertaken a systematic fight, the writer did not neglect any usual methods, such as fly papers and fly traps; but he did not find them very successful.

Attempts were made also to encourage as much as possible the natural enemies of flies, especially insectivorous birds. Swallows and martins were found to be pronounced useful; as it was found that sparrows were prevented from their increase in numbers by occupying their nests during their absence. A campaign against these was undertaken, and quantities were reduced. The number of swallows and martins steadily increased, and they were not all about the buildings.

The increase of starlings was encouraged by putting up Berlepsch nests for them. Other insectivorous birds were encouraged in every

possible way (planting of pines and fruit-trees, destruction of their enemies, martens, polecats, weasels, squirrels, birds of prey, etc.).

Quantities of flies were also destroyed by the large numbers of kept at Eichelscheiderhof.

Thanks to all these measures, the stud-farm has now been very largely freed from the pest.

At the end of the article the writer alludes briefly to methods of protecting draught animals from flies and gadflies — close metal nets, and treating the skin with repulsive substances, such as fish-oil.

952 - Resistance of Various Animals to Arsenic. — WILBERG, M., with appendix SCHIMONOGOROFF on pathologico-histological researches (Report of the Pharmacological Institute of the University of Jurjeff), in *Biochemische Zeitschrift*, Vol. 57, Pt. pp. 137-252. Berlin, June 1913.

The subject of the resistance of animals to arsenic is of importance present in view of the recent progress on the pharmacology of arsenic particularly as regards the preparation and use of atoxyl and salvarsan. M. Wilberg's researches were directed to establishing the doses tolerated and the minimal fatal doses for various animals. After discussing the literature of the subject, he describes experiments on dogs, cats, rabbits, hares, rats, hedgehogs, guinea-pigs, fowls, pigeons, and adders; the doses tolerated are given in the following table.

Animal	Means of ingestion of the compound	Dose in gr. per kg. of body-weight	
		Potassium arsenite	Arsenic
Pigeons	buccal	—	1.78
	sub-cutaneous	less than 0.012	—
Rats	sub-cutaneous	0.0156-0.0176	—
Hedgehogs	sub-cutaneous	0.01-0.014	—
Rabbits	buccal	—	0.015
	sub-cutaneous	0.008-0.01	—
Dogs	buccal	0.03	0.03
	sub-cutaneous	—	—
	intravenous	0.007	—
Guinea-pigs	sub-cutaneous	0.009	—
Cats	sub-cutaneous	0.005-0.006	—
Hares	sub-cutaneous	more than 0.005 and less than 0.008	—
Fowls	buccal	—	less than 0.01
Adders	sub-cutaneous	0.012	—

From these results it is clear that different animals do not show the same degree of resistance to the action of arsenic. Rats are the most resistant, then come hedgehogs, guinea-pigs, dogs, cats. Arsenic resistance has no relation to size: the smaller the animals, the greater it is. Man is the least sensitive of all animals, probably owing to the great development of his nervous system.

The subcutaneous tissue of dogs is very sensitive to injections of potassium arsenite, and becomes necrosed at the place of injection, as does the subcutaneous tissue. Hares are much less resistant than rabbits to subcutaneous injections. With pigeons and dogs, vomiting readily takes place, but strong doses of arsenic introduced through the mouth are almost without action.

For the minimal fatal doses, the writer has collected in a table the results of the great many investigators (Busscher, Brouardel, Rouyer, Salkowsky, Sieber, Kochmann, Kinkel, Doyen and Morel, Fröhner, Hausman). His experiments were made with hedgehogs, and gave doses of 1 to 0.015 of potassium arsenite by sub-cutaneous injection.

The article is followed by an appendix containing the results of pathological researches made under the microscope on various organs of dogs, cats and rabbits treated with arsenic.

Fate of Tubercle Bacilli outside the Animal Body. BRISCOE, CHAS. F. in *University of Illinois Experiment Station, Bulletin* No. 161, pp. 277-375. Urbana, Illinois, November 1913.

The results of this experimental work are given in tabular form. The article is accompanied by a bibliography referring to 160 publications.

It is seen from the above-mentioned table that tubercle bacilli in pure culture, spread in thin layers on sterile glazed paper slips and exposed to direct rays of the sun, are killed in a very short time (1 to 4 minutes). When exposed to desiccation, pure cultures of these germs in thin layers are found to be dead in a few days. In sputum, and other foul material, they appear to live longer than the other nonspore-bearers, and are blown about so that the inhalation of dried sputum dust causes tuberculosis in test animals. Sunlight plays an important part in the disinfection of this tuberculous dust; thus dwellings, factories and places of business should have abundance of window space located so as to admit the light. Tubercle bacilli in cow manure lived 73 days, when a pure culture mixed with a sample of manure was exposed to weather conditions in a pasture in the shade, and as long as 49 days, when exposed to the sunshine. A sample of dung from a tuberculous cow, they were dead at the first made 13 days after exposure. These experiments, which the writers were disappointed to be unable to repeat, are worth repetition.

Tubercle bacilli in garden soil and in a dead tuberculous guinea-pig were in the latter were alive on the 213th and 71st days respectively.

In drinking water, which may be a source of infection, the bacilli of tuberculosis and of bovine tuberculosis live for a year.

In butter kept at -10°C , the tubercle bacilli retain their virulence longer than when the butter is kept at high temperatures (in the experiments mentioned 274 days), and constitute a serious danger.

- 954 - **Modifications in the Milk of Cows suffering from Foot-and-Mouth Disease.** — Muzga, O., Jassz, H., and Herz, K. (Report from the Municipal Chemical Laboratory of Stuttgart) in *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel sowie der Gebrauchsgegenstände*, Vol. 25, Part 9, pp. 512-551. Berlin, May 1913.

After a careful examination of the bibliography of the subject, the writers describe the methods adopted and the conditions under which they made their investigations. The results are shown on 26 tables, each dealing with one cow; complete analyses are given of the milk at various stages of the disease, with notes on the most striking phenomena in each case.

The conclusions arrived at are then compared with those of other investigators. It appears that the influence of the disease on the composition of the milk is not the same for animals of any one breed, nor for those in the same lactation period; it seems to vary in individual cases.

- 955 - **The Alcohol Content of Milk after giving Cows Various Doses of Alcohol and under the Influence of Habit.** — VÖLTZ, WILHELM and PARCHTNER, JOHANN in *Biochemische Zeitschrift*, Vol. 52, Parts 1 and 2, pp. 73-95. Berlin, June 25, 1913.

The question, whether alcohol given with the food passes into the milk and if so in what proportions, has often been studied but has not yet been satisfactorily answered; for this reason the writers have instituted some experiments on the subject.

The animals they experimented upon were two North German ones of the plains (Norddeutsche; Niederrungskühe) weighing about 1100 lb. each, of the age of 4 to 5 years and in the middle of their lactation. The experiments lasted from March 27 to April 29 of this year.

Cow No. 1 was fed good meadow hay, oat straw, malt germs, potato flakes, and dried yeast. During the experiment with alcohol she received with the alcohol 46.2 lbs. (sometimes 92.4 lbs.) of potato distiller's waste containing 1.98 lbs. dry matter and 44.22 lbs. water (or 3.96 lbs. dry matter and 88.44 lbs. water). The cow received the 44.22 lbs. of waste with the alcohol in one dose at noon, immediately after having been milked, or double the quantity in two equal doses, one at noon and the other in the evening.

It was not considered necessary to determine exactly the quantity of food consumed by this cow.

Cow No. 2 was given, the first day of the experiment (April 22), as much as during the preceding 13 days, 20.57 lbs. of dry matter under the form of dried beer yeast. From that date up to April 25 when the experiment ceased, the cow was fed only hay.

The alcohol, mixed with water, was given at the rate of 3.52 to 5 quarts of beverage, sometimes in one dose sometimes in two.

In order to determine in what quantity alcohol passed into the milk the cows were milked three times a day; the milk, which was always faultless, was weighed and immediately portions of it — weighing 100 to 200 grams and sometimes as much as 500 to 1000 grams — were distilled.

The annexed table gives the quantities of alcohol found in the milk and those given to the cows.

Experiment	Cow	Quantity of absolute alcohol given c. c.	Quantity of absolute alcohol found in the milk		
			Daily c. c.	Per thousand	In percentage of the quantity given
I	I	200	0.49	0.09	0.24
2		400	2.58	0.42	0.65
3		400	1.15	0.18	0.29
4		400 (1)	1.09	0.17	0.27
5		400	1.58	0.25	0.40
6		400	1.13	0.17	0.28
7		400 (1)	0.18	0.03	0.04
8		800 (2)	0.41	0.05	0.05
9		400	0.72	0.11	0.18
10		63	0.00	0.00	0.00
11		126 (3)	0.00	0.00	0.00
13		400	0.71	0.11	0.18
15		800 (2)	0.48	0.07	0.06
16		400	0.40	0.06	0.10
12	II	63	0.12	0.02	0.19
14		126 (3)	0.13	0.02	0.10

1) In 2 doses, each of 200 c.c.

2) " " " " 400 "

3) " " " " 63 "

The above figures show that only a small quantity of the alcohol given passes into the milk, and that the animals at last got accustomed to the alcohol and that always smaller quantities of it passed into the milk. Even with quantities reaching 400 c.c. in one dose and 800 c.c. in two doses, corresponding respectively to 0.8 and 1.6 per thousand of the weight of the animal, only 0.05 to 0.4 per cent. of the amount given passed into the milk. As the distiller's wash usually given by farmers does not contain more than 0.1 to 0.3 per cent. of alcohol, it may be assumed on the strength of these experiments that feeding distiller's wash presents no danger to the life and development of the sucking calves.

The writers have further experimented upon human milk and have found that after a moderate use of alcohol only small and harmless quantities of it pass into the milk.

956 - Experiments on Carnivora on the Economy of the Nitrogen of Food caused by Certain Salts, especially by Sodium Acetate. - PRSCHOCK, ERNST in *Die chemische Zeitschrift*, Vol. 52, Parts 3 and 4, pp. 275-330. Berlin, June 30, 1913.

The writer begins by summarizing the results of his previous studies on the subject, as well as the researches of Voltz, Grafe, Abderhalden and others on the action of several salts on the retention of nitrogen in the animal body. He also communicates the results of his recent investigations on the action of ammonium and sodium salts on the metabolism in dogs. The writer finds, as Abderhalden had found, that sodium acetate added to a certain ration reduces the exchange of nitrogen and especially the excretion of nitrogen in the urine. The same effects were produced by sodium citrate, sodium lactate, magnesium acetate, and ammonium salts. Sodium acetate often had a more energetic action in saving nitrogen than ammonium acetate, for which reason the writer cannot agree with several investigators who consider that ammonium salts and nitrogen free foods form complicated chemical compounds in the bodies of animals which can be utilised in building up its proteins.

According to the experiments of the writer it appears that it is the metal and not the acid radical which causes the action of the salts in hindering the elimination of nitrogen. In a future number the writer proposes to publish the results of experiments which he has conducted on herbivorous animals.

957 - Acorns and Beechnuts as Food for Stock (1). - ENGELS, O. (Report by the Speyer Agricultural Experiment Station) in *Die landwirtschaftlichen Versuchsstationen*, Vol. LXXXII, Part 1-2, pp. 93-148. Berlin, June 1913.

The writer divides his article into two parts, dealing respectively with acorns and beechnuts.

I. Some general information is given on the distribution of the two species of oak.

Coming to acorns, the writer gives the results of analyses made by certain investigators, as well as his own, made on samples from various parts of the Palatinate. The determinations were made according to the method approved by the "Verband landwirtschaftlicher Versuchs-Stationen in deutschen Reich" (Union of German Agricultural Experiment Stations). Crude fibre was determined according to J. König's method.

Analyses of six samples of air-dried acorns gave the following results

(1) For the use of acorns for feeding stock, see No. 3190, B. Nov.-Dec. 1911; No. 8 B. April 1912. (Ed.)

Kernels:	per cent.
Moisture	36.02 — 46.63
Crude protein	3.49 — 4.11
Ether extract (fat)	1.68 — 2.57
N-free extract	44.58 — 53.21
Crude fibre	2.00 — 2.94
Ash	1.54 — 1.84
Hulls:	
Moisture	25.75 — 36.25
Crude protein	1.94 — 2.73
Ether extract (fat)	0.49 — 1.76
N-free extract	29.98 — 39.94
Crude fibre	26.84 — 33.49
Ash	1.50 — 1.79
Whole acorns:	
Moisture	34.57 — 44.82
Crude protein	2.27 — 3.91
Ether extract (fat)	1.62 — 2.42
N-free extract	43.09 — 50.86
Crude fibre	5.73 — 7.26
Ash	1.53 — 1.78

Further investigations were made on the components of acorns. They are a food poor in protein, but yet of considerable nutritive value owing to their high content of carbohydrates, and also very digestible. The characteristic components are tannic acid and a bitter principle, quercine. These two bodies may give rise to digestive troubles, particularly constipation, if acorns are fed in large quantities. If the acorns are spoiled or musty, they may be dangerous; they should therefore be kept as carefully as possible. Freshness is the best guarantee of their feeding value.

Next to game, pigs make the best use of acorns; sheep and goats also use them occasionally. In Southern Hungary and Slavonia (1) the pigs are driven into the oak woods, where they pick up the acorns and can thus be fattened for slaughter, as they also eat various plants, fungi, etc., which supply them with the mineral matter (phosphoric acid and lime) which is lacking in acorns. If the pigs are fed in sties, they should be given small quantities, especially to begin with, not more than 2 to 3 lbs. per head per day; the ration should be made up by green food, nitrogenous food and plenty of water. Under these conditions, acorn feeding produces excellent results, but without care the results may be anything but good. Acorns are best fed to pigs crushed and mixed with the other food. When given with other food they have a strong binding effect. It is a good thing to spread them in paddocks where pigs are running.

Goats and sheep may be given small quantities of acorns; fattening locks may get up to 6 lbs. per 1000 lbs. live-weight, but they must be supplied with plenty of green stuff, such as beet leaves and slices, as well as roots

(1) Also in Italy, Spain, Portugal, etc.

(Ed.).

and concentrated nitrogenous food (bran, etc.). For dairy cows and horses the bitter principle must be removed, or they should be cooked; and they must always be fed in moderation and gradually.

It is always safer to use dried and hulled acorns, as the hulls (which make about 15 per cent. of the total weight), have a very low nutritive value and contain the bulk of the injurious substances.

Dried and hulled acorns, even at about 7s 6d a cwt., may be considered a useful and fairly cheap food. There is no doubt that thousands of pounds worth are lost to German agricultural economy in the woods each year.

II. Beechnuts may well be used for feeding pigs and sheep, though so far such use is limited. The writer gives information on the distribution of beech, especially in Germany; he discusses the conditions of temperature, moisture and soil necessary for it, and describes its botanical characters. He then goes on to the chemical composition of the nuts, giving the analyses made by several investigators (Boussingault, Schädler, König), and his own results from the analysis of samples from the Forest Office of Karlsruhe. These figures are as follows:

Kernels :		%
	Moisture	14.04
	Crude protein	24.52
	Ether extract (fat)	36.31
	N-free extract	11.24
	Crude fibre	9.59
	Ash	4.30
Hulls :		
	Moisture	20.51
	Crude protein	3.36
	Ether extract (fat)	0.91
	N-free extract	32.74
	Crude fibre	37.49
	Ash	2.64
Whole nuts :		
	Moisture	16.25
	Crude protein	17.25
	Ether extract (fat)	24.16
	N-free extract	19.47
	Crude fibre	19.15
	Ash	3.72

Besides the general chemical analysis, more detailed investigation of the composition was made.

The nutritive content of beechnuts is high, and their digestibility excellent, especially when they are hulled. Feeding trials have shown that a certain quantity of beechnuts can well be fed to stock. The writer commends that they should not be given to horses, as they may be harmful. A report by Pusch in the *Berliner Tierärztliche Wochenschrift* mentions that horses are specially susceptible to the action of a poisonous component

agine, occurring in beechnuts. Experiments in France have, however, shown that horses may be given up to 6 ½ lbs. daily of beechnuts without effects. No bad effects are shown by cattle, sheep, pigs, rabbits or poultry on moderate rations of beechnuts.

The chief use of beechnuts is for fattening pigs in the woods; here, too, it should be remembered that heavy feeding on these nuts requires plenty of drinking water.

The writer recommends that beechnuts should be hulled; this can easily be done in ordinary mills. Keeping the nuts requires special care; the best method is to spread them out on a floor in a thin layer and turn them every day so that they keep on sweating; otherwise they very easily go mouldy and various poisonous decomposition products form in them. If they will in spite of these precautions, they must be cooked before feeding.

To collect the fallen beechnuts, the simplest way is to sweep them up into heaps and clean them by winnowing. The drying may be hastened by putting them in layers on screens in a heated room. They should be collected in dry weather, as otherwise the hulling will give trouble.

Although beechnuts are not equal to acorns, yet when properly used they form a food not to be despised.

18 - **Castration in Relation to the Secondary Sexual Characters of Brown Leghorns.** GOODALE, H. D. in *The American Naturalist*, Vol. XLVII, No. 355, pp. 159-169. New York, March 1913.

After a brief introduction in which mention is made of cases of sexual version in individuals belonging to species of birds possessing marked sexual dimorphism, and which cases were accompanied by lesions of the ovaries in the females and castration of the males, especially in domestic breeds, the writer sets forth the reasons which induced him to select Brown Leghorns for his experiments, namely their adult plumage, which is strongly sexually dimorphic, and is practically identical with that of the Jungle fowl; the size of the comb of the female; and the fact that there are at least three distinct stages in the development of the young birds' plumage before the adult colour is reached. The first two stages do not exhibit sexual dimorphism, nor are they identical with that of the adult female. Sexual dimorphism appears first in the third juvenile plumage.

The writer describes and collects in tables comparative statements of the chief secondary sexual characters common to all varieties of domestic chickens and those special to Brown Leghorns. He examines minutely these characters. He then reports the results of his experiments. The chickens — male and female — were castrated when they were 10 to 28 days old, that is, much younger than in the case of commercial caponization. Seven of the castrated males reached the age of four months, then three were killed. The autopsies showed an entire absence of testicular material in two cases. The third had a tiny node, possibly testicular. All four survivors were kept until they were 10 months of age.

Two were then killed for study. They developed the normal plumage of the male, and were it not for the small comb and wattles they

would have had nearly the same appearance as a normal cock. They are, however, somewhat fuller plumaged and rather heavier looking birds than a normal cock. They are less active in their movements, are non-combatants and show no sexual instincts. They have never been heard crowing. One of these capons had much the same appearance as a normal cock, he had a large comb but did not crow; at one time he showed some inclination to pay attention to the hens, but it never went as far as an attempt at copulation. At the autopsy it was found that there had been an autoplasmic transplantation of a bit of the testis.

It will have been observed from the foregoing description, that the small comb of these capons is the only character which might be considered female. In all other points the characters are those of the cock, sometimes exaggerated (feather length), sometimes infantile (crowing instinct).

As for the lesser development of the comb, it may be affected by so many conditions that the question as to whether or not the capon has a female type of comb is not easily answered.

Of the hens which were castrated, only one of the females from which the ovary (only the left, since it was assumed that the right had completely degenerated) was removed, reached maturity. There is no doubt as to the effect of ovariectomy on this individual, which passed as a cock with those unacquainted with its history. Nevertheless the assumption of male characters has not been quite complete. First the presence of feathers on the back which are very much hen-like. Second the wing bow is poorly developed. In behaviour the bird showed lack of the crowing instinct, non combativeness and general indifference to the hens. In another castrated female which died at the age of four months, when the first feathers of the third stage began to appear, they were like those of the young male. The later feathers, however, were those of the normal female, owing to the regeneration of the ovary as was found at the autopsy.

These experiments then indicate clearly that while the female Brown Beghorns may assume male characters following the removal of the ovary, the male assumes no positive female characters after removal of the testes.

The writer closes his paper with some considerations of a theoretical nature on the results and on the value of his experiments.

959 - **Breeding-Experiments with Ducks.** — GOLDSCHMIDT, R. in *Zeitschrift für Induktive Abstammungs- und Vererbungslehre*, Vol. IX, Part 3, pp. 161-191. Berlin, April 1913.

The writer has been led to publish the results of his experiments by the appearance of two articles by Phillips and Goodale on the same subject. He has used a number of different races and crosses. He has come to the conclusion, already reached by Phillips for total body development, that stature is to be considered a Mendelian character. But whether it is a

apple or a complex one is not yet known. The writer's experiments were limited to two generations of descendants.
The article is accompanied by four diagrams and numerous tables.

1. — **A Kansas Calf-Wintering Test.** — *The Breeder's Gazette*, Vol. LXIII, No. 20, p. 1164. Chicago, May 14, 1913.

At the Kansas Agricultural College on May 2 was held a most successful meeting of cattlemen, of whom upwards of 500 were present.

President W. J. Waters gave an illustrated lecture on "How a Steer Grows". This lecture was followed by a judging demonstration given by C. W. McCampbell. Prof. W. A. Cochel presented the results secured feeding silage to fattening cattle and C. M. Vestal presented the results of the winter feeding experiment in the maintenance of calves.

With the present prices of beef there is an incentive to carry the calves through the winter in better condition than ever before; the experimental work was therefore confined to economical methods of wintering of calves.

Early in January, 50 high grade Hereford calves were purchased at \$32 per head. They were shipped to Manhattan and held a few days in order to overcome the effects of shipping and to fill up well before the experimental work was inaugurated.

Taking into consideration all the expenses incurred they cost \$7.80 per cwt. at the beginning of the test on Jan. 21. They were divided into five equal lots and fed as follows:

Lot 1, corn silage according to appetite and 1 lb. cottonseed meal per head daily. Lot 2, kafir silage according to appetite and 1 lb. of cottonseed meal per head daily. Lot 3, sweet sorghum silage according to appetite and 1 lb. of cottonseed meal per head daily. Lot 4, corn silage and alfalfa hay both according to appetite. Lot 5, alfalfa hay as fed to Lot 4 and shelled corn equivalent to the corn in the silage fed to Lot 4, plus corn stover according to appetite. The only difference in the feeding of Lots 1, 2 and 3 was that the silage was made from different crops, such as corn, kafir and sweet sorghum; of Lots 1 and 4 that the protein was from different sources: cottonseed meal and alfalfa hay; of Lots 4 and 5 that the corn was fed as silage in one lot and dry forage in the other.

The results indicate that there is less difference between silage from different sources as a feed than there is in the yield per acre of the different crops. Under local conditions sweet sorghum will produce the largest yield of silage, followed by kafir and corn in the order named. The results secured in the test indicate that the ten calves in the first three Lots could be wintered for 100 days on slightly less than $\frac{1}{2}$ acres of silage with an outlay of \$14 for cottonseed meal. In Lot 4, where alfalfa hay and silage were used, less than an acre of alfalfa and

approximately an acre of silage were necessary to carry ten calves for the same period, and in Lot 5, an acre of alfalfa, an acre of corn and stover combined and two of stover alone were required to secure the same result. The value of the silage is thus shown in that it increases the live stock carrying capacity of the farm.

In giving values to the various feeds used, the local price or cost was charged with a sufficient increase to account for the cost of feeding. The important fact of the tests is that when all feeds were used at prices which are decidedly remunerative to the grower, gains were made at an average cost only slightly more than $3\frac{1}{2}$ cents per pound. Another fact of almost equal importance is that calves could be purchased at £ 32 per head or \$ 7.80 per hundred and fed on the coarsest feeds produced on the farm and yet return an average of \$ 5 per head above the cost of feed and labour. The final estimates were based upon feed lot values of \$ 7.50 to \$ 7.60 per cwt. The entire lot was taken to graze on a ranch during the summer and their further development will be followed in order to secure information on the influence of the winter rations.

961 — **Cattle Raising in Jamaica.** ROBERTSON, T. G. M. in *Bulletin of the Department of Agriculture of Jamaica*, Vol. II, No. 6, pp. 155-158. Hope, Kingston, Jamaica, January 1913.

The writer, referring to the experiments made by Mr. Gosset at Belvidere with Indian and Porto Rico cattle, gives the results of the researches which he has himself carried out at Burnt Ground.

Mr. Robertson considers it necessary to produce a type of cattle in Jamaica which will, as far as possible, combine the size, development and hardiness of Indian cattle with early maturity and an aptitude to fatten well. It should, however, not be forgotten that Jamaica is a tropical country with a tropical climate, and that the first consideration is to prevent calf mortality. Good results were obtained by the writer, who used cows with a considerable amount of Indian blood, and half-bred Devon, Hereford and Short-horn bulls.

962 — **Wool Production in French West Africa and the Introduction of Merina.** — DE GERONCOURT, G. in *Bulletin mensuel de la Société de Géographie commerciale de Paris*, Vol. XXXV, No. 4, pp. 225-239. Paris, April 1913.

The development of the world production of wool does not seem to keep pace with the demand; the Tunisian supply, for instance, is decreasing, and the Argentine stock, an important factor in the market, seems also to be diminishing. This state of affairs has led to the idea of utilizing vast pastoral districts in French West Africa for wool production. Sheep occur throughout Africa, and can withstand more severe climatic conditions than the hardiest zebu. But in the equatorial regions the various breeds have lost many of their primitive characters, especially that of producing wool. The hair of the Central African breeds is unsuitable for weaving; indeed at first sight, they do not seem to differ much from the goats found in the same latitudes.

In the French Soudan, however, chiefly between Djenné and Lake subine, there is a race of woolled sheep, known as the "Macina", which encouraged hopes for wool production. The fleeces are used, in the neighbourhood and the natives of the Niger weave blankets of unbleached wool; are sometimes quite artistically covered with designs in spots, and 28 6d to 20s according to quality; the inhabitants wear them on cold days, when the thermometer may fall as low as 6° C. (43° F.), at Lake Debo. A trial of exportation of this wool has been begun in 1912 the Mopti trading stations sent 200 tons to France and those Djenné 20 tons. Unfortunately this wool was found to be of poor quality that it could only be used for mattresses, as the machines do not deal with it owing to its being nearly all coarse hair. Its price in the Niger was £20 to £24 ton, and in Europe £60. These sheep, which are presumably introduced by shepherds from the north and are probably degenerated descendants of Libyan flocks, are by no means uniform in they are a mixture of woolled and non-woolled sheep, and the constant tends to further mix the fleeces.

The Government of Upper Senegal and the Niger has issued a decree regarding the separation of the woolled and non-woolled sheep; this has had some influence, in spite of the difficulties due to the migration of the flocks, which travel between the semi-desert Sahelian zone and the lacustrine zone of the Middle Niger. The latter zone, subject to from the river, contains enormous reserves of pasturage (*Panicum* available for several months in the year; its area is some seven million acres, that is about three times the area flooded by the Nile in Egypt. would allow of a great increase in the number of sheep and cattle: it is therefore natural to think of increasing the breeding of the woolled Macina, which may be practised also throughout the Sahelian zone, especially at Fouta-Djallon and the Mossi.

For the improvement of the wool of this breed, the Government of Upper Senegal and Niger started in 1907 the sheep-farm of Niakhar, between Lake Debo and Timbuktu. In 1908 an unfortunate importation was made: eight rams, four Southdowns and four Rambouillet from Patagonia, died the following year; next seventeen rams, Algerian, mixed Barbary and Barbary Merino, were brought from the province of Oran; in 1910 eight more Barbary Merino rams arrived; in 1911, eighty were brought: Oran Merinos crossed by Barbaries, and Barbaries by Oran Merinos. In November 1912, the flock numbered 101 Algerian sheep, 283 pure, 660 half-breds, and 141 three-quarter-breds. The weight of the best bred fleece was 2 $\frac{3}{4}$ lbs., while the indigenous sheep give not much more. However, the efforts of a model sheepfarm to improve the wool of the whole country cannot give anything but slow results.

The Chamber of Commerce of Tourcoing, wishing to obtain precise information on the future of the wool-trade in French West Africa, has appointed a Special Commission with M. Henri Dewarin as secretary.

Considering the good results obtained in British East Africa by the introduction of Merino rams and ewes from Australia, the Commission

believes that the best means of promoting improvement in the product of wool will be to purchase pure Merinos in Australia and keep them at station in French West Africa as a pure breed, or as crosses with the native sheep.

The writer, who has been consulted by the Tourcoing Chamber of Commerce, thinks that before the Government of the Colony and private persons embark on the expense necessary for an experiment of this sort, it would be well to make a preliminary study in British East Africa and northern Australia, to find out what are the extreme conditions under which wool-bearing sheep can be successfully kept, especially as regards climate and parasites. It is only after most careful enquiry that the acclimatization of fine-wool Merinos should be attempted under conditions so unfavourable as those of the Soudan.

963 - **Fat Lambs at Ruakura.** — MC CONNELL, PRIMROSE in *The Journal of Agriculture of the New Zealand Department of Agriculture, Industries and Commerce*, Vol. VI, No. 1, pp. 271-273. Wellington, March 15, 1913.

On the 1st of February 1912, 600 Lincoln Romney full mouthed ewes were put to the rams, half to Border Leicesters, and half to Southdowns at the rate of fifty ewes per ram.

The ewes were then kept in one flock and were constantly moved from paddock to paddock, this accounting for their fine condition at the lambing season commenced. From a week previous to lambing they received a full ration of mangolds and this was the means of keeping a good flow of milk. The lambs were sold to local butchers having been fed up to the time of being sold in a paddock of rape.

The number of Border Leicester crosses that were sold was 308, taking into account the value of the ewe's wool, the gross profit realised from each ewe was £ 1 15 10d.

The Southdown crosses sold were 372 and the gross profit per ewe — including the wool — was £ 1 4s 10d.

The economical results were thus more favourable for the Southdown crosses which give a superior carcase and come earlier to maturity.

As for weight though the Border Leicester crosses seem somewhat better.

This season the experiment will be continued on 800 ewes, half being put to the Southdown rams and half to the Border Leicester.

964 - **The Utilization of Skimmed Milk and Potatoes by Feeding to Pigs.** HANSEN in *Mitteilungen der Vereinigung Deutscher Schweinezüchter*, Year 20, No. 1, pp. 264-268. Berlin, July 1, 1913.

The writer, after pointing out the progress that has been made in Germany in the fattening of pigs, thanks to the introduction of English blood in the breeds and to the better way of feeding, describes some new foods and then turns to the practices of pig feeding that have been current in the north west of Germany. This practice consists in fattening the pigs at the age of 10 weeks on a feed composed exclusively of barley and meat and fish meal (a mixture of equal parts of each) and

which at the age of 20 to 24 weeks they reach the weight of 237 to 242 lb. and are ripe for the butcher. For every 100 lbs of live weight at the beginning of this treatment an average of 3.4 lb. of starch value and 0.87 lb. of protein are given, towards the end 2.5 lb. and 0.85 lb. respectively. The daily gains in weight amounted according to the calculations of Dr. Lehmann of Göttingen to about 1.32 lb. per head. The writer is of opinion that this way of producing pork would not be advisable for the East of Germany where it would imply a limitation of bood crops, one-sided development of farms, a greater dependence upon foreign markets as well as a diminished utilisation of skimmed milk and of potatoes. Potatoes and skimmed milk at present yield the greatest profit when they are transformed into pork. Experiments conducted by the writer at the Agricultural Institute at Königsberg show that 2s 3 1/2d are realized per cwt (112 lbs.) of potatoes when the daily gain is 1 lb. 7 oz and the price of pigs is £ 2 5s 9 1/2d per cwt. In this calculation the barley that is fed is valued at 7s 11 1/2d and the meat and fish meal at 10s 10 1/4d. while the general expenses are set down at 12s 8 3/4d per head. When therefore unsorted potatoes cannot be sold at the farm at 2s or 2s 6d per cwt. it is more profitable to feed them to pigs. One gallon of skimmed milk when fed with potatoes, barley and flesh and fish meal realizes 1.81d per gallon, and in favourable cases as much as 2.14d per gal. In view of these results it is advantageous to base pig feeding in the East of Germany on the utilization of the potatoes and dairy by-products of the farm. For the carrying out of this plan of feeding the writer has calculated tables of rations.

- **Ostrich-Farming in German West-Africa.** - BERTHOLD H. in *Deutsche Kolonial Zeitung*, Nos. 22-23, pp. 360-362 and 380-382, Berlin, May 31 and June 7, 1913.

The live stock industry is becoming important in German West Africa, and includes cattle, horses, sheep, and goats.

To this list should now be added ostrich farming which is a very remunerative undertaking. The latter industry is of recent growth, for the 1912 census, only 1300 birds are recorded, and the exports of others in 1911 were to a value of £3 960 while those of the Union of South Africa in 1912 attained the value of £2 580 000.

As wild ostriches are very abundant in German West Africa, and may be used for out-crosses, there is no danger of the domesticated birds degenerating from prolonged in and out breeding. Moreover the strict has no winter rains which prove so fatal to young birds, especially those hatched late in the season (up to November).

On the other hand suitable fodder plants are lacking, therefore irrigation works must be undertaken to be followed by the sowing of lucerne, principal fodder crop, and the erection of fences to divide the land into paddocks and to prevent the male birds from fighting. The writer recommends that ostrich farming should be combined with some other form of farming, more especially sheep farming.

The Government of German West Africa have acquired a few domesticated ostriches from Cape Colony with a view to forming a stud at the model farm of Otfituesu where birds will be raised to be eventually used for crossing with the captured wild birds.

Ostrich hunting has been prohibited on German territory.

966 - Consumption of a Hive of Bees during the Year. — HOMMELL, R. *La Vie agricole et rurale*, Year 2, No. 22, pp. 653-655. Paris, May 2, 1913.

The reasons for the consumption of food in a hive of bees are as follows: 1) maintenance of the life and activity of the bees, in the hive and outside; 2) feeding of the brood; 3) secretion of wax; 4) feeding of the drones.

The daily consumption of a bee varies from 0.003 gm. to 0.12 gm., according to the conditions of life, with a fairly general mean of 0.03 gm. The total food consumed by a worker larva in its feeding period is 0.4 gm.; the daily consumption of a drone is 0.04 to 0.05 gm.

With these data one may attempt the calculation of the total consumption during the year, taking a strong swarm in a large box hive, in a district where there is one great honey period lasting a month; the different phases of activity and consumption may be summed up as follows:

Period	Average population of the hive	Workers at work:						Total consumption
		in the hive			collecting honey and wax			
		Number	Consumption:		Number	Consumption:		
			per bee per day	total for the period		per bee per day	total for the period	
			gm.	kg.		gm.	kg.	kg.
February	20 000	20 000	0.006	3.6	—	—	—	3.6
March-April . .	40 000	30 000	0.03	54.0	10 000	0.06	36	90.0
May	60 000	40 000	0.04	48.0	20 000	0.06	36	84.0
June	80 000	40 000	0.06	72.0	40 000	0.12	144	216.0
July-August. . .	60 000	40 000	0.04	96.0	20 000	0.06	72	168.0
Sept.-Oct. . . .	40 000	40 000	0.03	72.0	—	—	—	72.0
Nov.-Dec.-Jan. .	30 000	30 000	0.006	16.2	—	—	—	16.2
Totale . . .								649.8

For calculating the consumption of the drones, one may reckon 198 in a strong hive, and the time during which they occur is about two months, separated into two or more periods by intervals during which there are none.

king Godon's figure of 30 gms. (just over 1 oz) for the daily consumption 1000 drones, it is found that the 1500 consume in two months 2.7 kg. lbs.). This will give a total of 650 kg. (1430 lbs) in round figures, for the intenance of the life of the hive. But this amount does not represent lished honey as it is taken from the hive, but a nectar-like substance staining 75 or 80 per cent. of water; this would give 182 kg. (400 lbs) honey. To this amount must be added the food required by the brood.

The bee-population renews itself four times in the year; but this replacement does not extend to the whole 80 000; taking it on 60 000 only, we 240,000 larvae to be reared. Each larva requires a minimum of 0.5 gm. bee's bread, making a total of 96 kg. (211 lbs.); reckoning that this cons of one-third each water, pollen and honey, the honey consumption for brood is 32 kg. (70 lbs).

There remains the secretion of wax. With all the frames moveable bees get back all the section emptied by the extractor, or failing them ed sections ready for them to build upon; but M. de Layens' experi- nts show that it is better to let them build about five sections of 15 sq. each containing a total of 660 gms (1 ½ lb.) of wax. This amount produced economically and without diminution of the yield of honey, at the same time it means about 7 lbs. of food per pound of wax, or the 1 ½ lb., about 10 lbs.

These estimations put together are as follows;

Maintenance of the bees	400 lbs.
Feeding of the brood	70 "
Wax production	10 "
Total	480 lbs.

Although this figure seems large, the writer considers it is probably small really; he points out that bees work much more to live than to ; as if the hive under consideration gives an average of 45 lbs. of honey eds more than ten times that amount of food to produce it.

- **Silkworm Rearing in Tropical Countries.** — FAUCHÈRE, E. *Le ver à soie.* — *Bulletin économique de Madagascar et Dépendances*, Year 13, No. 1, pp. 92-111. Antananarivo 1st quarter 1913.

The writer believes that the information collected by him, based on reepee in Madagascar will be of general bearing for tropical countries. It is generally believed in Europe that the monovoltine and poly- ne silkworms belong to quite different races. But experiments on race reared in different climates allow the conclusion to be drawn any particular race may be both monovoltine and polyvoltine. If rorms from Southern Europe of annual or monovoltine races are ta- to a tropical climate, they eventually adapt themselves to the new itions of life, becoming polyvoltine. This has happened with all the al races introduced into Madagascar, as well as to Guatemala and r parts of Central America. It is well known that atmospheric cons exercise a great influence on the quality and quantity of silk; but

this is not sufficiently considered when it is stated that a race which has become polyvoltine is degenerate and will inevitably give inferior silk. The truth is that these polyvoltine races are kept in countries in which the climatic conditions are not suitable, and are always reared by natives who are by no means careful or expert.

The results obtained in Central Madagascar and at Reunion show that European silkworms, when acclimatized to the new conditions and changed to the polyvoltine state, continue to produce a silk equal in quantity and quality to that obtained in France.

It seems to the writer that the silkworm should be considered as an insect of tropical climates (constant temperature), and the monovoltine state as an artificial one produced by the rearers to adapt it to the European climate (variable temperature). Observations of practical breeding allow one to state that very hot and moist climates of the equatorial and tropical zones do not allow the production of silk of first quality. But the climate of Central Madagascar, as well as that of the high parts of Reunion, seems to suit the silkworm admirably. Further practical observations have shown that moistness of the atmosphere, which is so harmful in countries with a variable temperature, has no bad effects in tropical countries, unless it remains near saturation point for several days in succession.

The production of silk from *Bombyx mori* can be undertaken in all very hot, and even very moist, tropical countries, but first-class cocoons can only be expected in mountainous parts, where the temperature is not very high, insolation is intense, and winds are frequent, all of which conditions occur in Central Madagascar.

Number and period of the rearings. — In this district the silkworm moth has five generations per year; but one of them, occurring in the cold season, cannot be used for industrial rearing. From the hatching of the caterpillars to the collecting of the cocoons about 45 days elapse, so that if eggs ready to hatch were to be had, at least six crops of cocoons could be got in the season, lasting from the middle of September to the middle of May. From the middle of September to the end of November the silkworms do splendidly; December is generally very rainy, so it is better to arrange not to rear any worms during this period.

Nurseries. — There is so far no general agreement as to the type of nursery best suited for tropical countries. It has been asserted that nurseries built on the European plan, with plenty of openings to ensure continuous and thorough ventilation, are unsuitable for the conditions in Indo-China; in Madagascar, however, the silkworms give better results the more thoroughly the nurseries are ventilated. They may be made of unbaked or unbaked bricks, with tiled or thatched roof; it is better to raise the ground-level a little to keep out moisture, and to make a flooring which may be simply of well-beaten clay. The advisability of making a ceiling is indisputable; but all the same many European rearers in Central Madagascar get good results without.

The arrangements for aspect of the rooms, lighting and disinfection and inside treatment of the nurseries are the same as for silkworm rearing in Europe.

The temperature at Antananarivo during the rearing season (mid-April to mid-May) varies between 18° and 25° C (64° and 77° F.); there is therefore no urgent need for heating; but still, to avoid prolonging the first and last rearings beyond 37 or 38 days, it is as well not to let the temperature fall below 19 or 20° C (66 or 68° F.). In the higher temperatures heating must go on till the middle of November, and even during hibernation to prevent dampness.

Feeding. — In Europe it is said that the age of the leaves ought to keep pace with the age of the caterpillars; in Madagascar caterpillars in the fourth or fifth stage can manage four-months old leaves quite well. The number of times fresh leaves are given per day varies; the hotter and drier the weather the more often must this be done. When the caterpillars are young they should be fed eight or ten times a day; later six or seven enough. But in the fifth stage they must be fed so that they are never without leaves. From observations at the Silkworm Station at Tananariva it appears that to rear an ounce of eggs (1) about 1200 lbs. of leaves are required: they must be carefully sorted and cleaned. The weight of leaves eaten during the different stages is as follows:

1st stage	0 ½ lbs
2nd "	16 "
3rd "	61 "
4th "	194 "
5th "	915 "

Length of stages. — In Madagascar the stages are slightly shorter than in Europe, with the exception of the last, which brings the whole larval period to about the same as in France. The following are the figures:

1st stage	5-7 days
2nd "	4-5 "
3rd "	5-6 "
4th "	6-7 "
5th "	11-13 "

Killing and drying. — For killing and drying the cocoons, the various methods used in Europe may be employed; but in countries in which polytine silkworms are reared and the spinning can go on for six or eight months in the year, machines of smaller capacity can be used than in Europe. It would be possible to make simple machines for hot countries doing away with the motor and the ventilator, thus realizing a considerable economy. Driers similar to those used for fruit, with circulation of air, might be used. In Indo-China a type of drier invented by M. Emery,

(1) Ounce of 25 gms.; the ounce avoirdupois = 28 gms.

simple and easily transportable, is much employed. This drier consists of a little square or rectangular fire-place, above which are arranged small compartments fitting exactly one on top of another. The bottoms of the compartments, on which the cocoons are piled, should be of wire netting; the hot air passes up through the cocoons and at the same time kills them and dries them.

Diseases and enemies of silkworms. — Of all the diseases attacking silkworms in Madagascar, the "grasserie", considered very unimportant in Europe, is the worst. Predisposing causes are: lack of ventilation, excessive heat, and in particular the use of too young leaves.

Among the enemies, ants and rats devour both the caterpillars and the cocoons. Further, there is a fly, known as "oudji" in Japan, which oviposits in the caterpillars; the larvae developing within kill the caterpillar before it spins; a caterpillar with only one or two of these larvae in it spins a cocoon with little silk in it, and dies as a chrysalis. This fly is common in the silkworm-rearing parts of Asia; in India it is called the "silkworm fly", in Indo-China "kufi" and "connhang", M. Vieil speaks of another fly, which attacks the caterpillars when they climb up to spin, and whose sting is immediately fatal.

The "landibe" (*Borocera madagascariensis*) is attacked by flies which seem to be related to the "oudji", but so far these have not been recorded from the silkworm nurseries.

FARM ENGINEERING.

968. — **The Development of Agricultural Machinery** [during the last 25 Years]. FISCHER, G. in *Maschinen-Zeitung*, Year 11, No. 12, pp. 141-150. Berlin, June 15, 1912.

The paper reviews the important progress that has been made in agricultural and auxiliary machinery during the last 25 years. Considerable improvement has been effected in connection with motors driven by heat, and agricultural portable engines have attained, thanks to superheated steam, a degree of perfection which allows a great saving of water and of fuel. Equal improvements have been effected in liquid fuel and electric machines. As for machines for tilling the soil and for preparing forage, the progress has been chiefly in the direction of improving those machines which existed already in a general form 25 years ago.

The writer next examines briefly the work done in connection with dairy machines and lastly the great changes accomplished in the cultivation of agricultural produce.

969. — **Competition of Machines for Tilling the Soil, at Chulnitsa, Rumania.** THALLMEYER in *Deutsche Landwirtschaftliche Presse*, Year XI, No. 46, p. 557. Berlin, June 7, 1913.

The following firms took part in this competition, which was held from May 25 to 28: Lenz of Mannheim with his motocultivator built on Kőszegi's system; Bajac of Liancourt, France, with a cable outfit consist-

g of a bedzin tractor and balance plough, machines which in the competition belonged to different classes. The real plough tractors, with wing ploughs, which took part in the competition tests were the following: Hart-Parr, Caterpillar, Big Four, Twin City and Pioneer, the last two of which were tried for the first time in Europe.

The trial consisted of ploughing 24.7 acres to a depth of 7.08 inches. The American tractors worked with eight-furrow ploughs (Hart-Parr, Big Four, Pioneer), with ten-furrow ploughs (Caterpillar), and with twelve-furrow ploughs (Twin City); Bajac's outfit worked with a three-furrow balance plough. The Chulnitzer competition was organized by the indication of the Jalomitza district farmers. The ground on which the tests were made was perfectly flat and in the most favorable conditions of moisture. The judges have not published the results of the competition.

o - **The Competition of French Beet-lifting Machines.** in *Blätter für Zuckerrübenbau*, Year XX, No. 10, pp. 146-151, Berlin, May 31, 1913.

This competition was held at Corbeaulieu near Venette (Compiègne) October 1912. The soil of the field in which the machines were tried was a deep loam. The crop was estimated at 10 to 12 tons per acre.

The firm Bajac of Liancourt presented a lifter for three rows of beets which seemed well built and easy to handle. Each row is lifted by shares which end in a rounded extremity and which with the forward motion of the machine lift all the earth round the beets. The ground is loosened to a depth of about 5 inches.

While this machine represents a simple beet lifter which, however, has given satisfactory results, M. Degremont, a machine builder of Leateau (Cambresis), presents a lifter and toppler which lifts the beets, separates them and lays them in little heaps. In order to obtain this result required two apparatus working, one after the other, on three rows at the same time. The topping machine required 4 oxen; a driver, and a workman.

The lifter and cleaner presented by the same firm is in many respects noteworthy and is provided with several special devices which mark considerable progress in this direction. One advantage is that very few beets are damaged or broken and that the field is not grubbed up but remains in a condition for carting to be carried out, as the apparatus does not penetrate too deeply into the soil.

At the competition several other lifters and cleaners were presented but they were designed only for one row at a time, and this from the point of view of economy and the amortization of the machine is not sufficient.

The Société Anonyme Massart of Liège exhibited a lifter with two rows.

In this competition the most successful firms were Degremont and Bajac. The experiments yielded abundant results and prove that in the solution of this problem interesting both to agriculture and the sugar industry is receiving now much attention.

921 - **The Piltor Tractor.** Mention in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, Vol. 119, No. 5, pp. 705-708, Paris May 1913.

The experiments made with this tractor (14 HP) by the Agricultural association of Gien have given the following results:

	Heavy Oliver	Cockshutt
Plough used.	Plough (2 wheels, one furrow)	Sulky Plough (5 furrows)
Labour.	1 Mechanic 1 Labourer	1 Mechanic 1 Labourer
Depth of furrow.	9 $\frac{1}{2}$ inches	5 inches
Breadth "	13 $\frac{1}{2}$ "	29 $\frac{1}{2}$ inches
Average power.	926 lbs.	882 lbs.
Duration of experiment	30 Minutes	28 Minutes
Duration of work	21 "	24 "
Total area ploughed	487 sq. yards	1250 sq. yards
Velocity per second	36 $\frac{1}{2}$ inches	38 $\frac{1}{2}$ inches
Work transmitted to plough in H.P.	5.18	5.2
Consumption of fuel per HP in gallons.	0.382	0.417
Volume of earth loosened per gallon of fuel.	191 $\frac{1}{4}$ cubic yards	205 cubic yards

922 - **Meyenburg's Motocultivator.** — DE CONDÉ in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, year 112, Vol. 119, No. 5, pp. 699-704, Paris, May 1913.

This is a description and illustration of Meyenburg's motocultivator, the characteristic feature of which is the special construction of the milling teeth. They are of bent steel wire about one-third of an inch in diameter. They are flattened out at one end to a breadth of half an inch. The other end is fastened to a not completely closed ring by means of which they are attached to the shaft.

This machine has given the following results at a trial made at Bourges.

	1st day	2nd day
Breadth of work done	6.56 ft.	6.56 ft.
Average depth of do.	3.9 inches	4.73 inches
Velocity per second	6.7 "	6.69 "
Total area worked	5022 sq. yards	14. 35 sq. yards
Time required per acre	3h. 34 min.	3h. 34 min.
Consumption of benzol per acre	9.95 gals.	9.95 gals.
Volume of earth loosened per gallon of benzol	51.86 cub. yards	51.86 cub. yards

923. - **Portable Wheat Esiccator.** — HÖLTZERMANN in *Deutsche Landwirtschaftliche Presse* Year 40, No. 46, pp. 554-555, Berlin, June 7, 1913.

This esiccator, which of late years has spread widely in Russia gives very good results. The writer with the help of illustrations showing elevations and longitudinal section of the machine describes its construction and *modus operandi* and gives also an estimate of the cost.

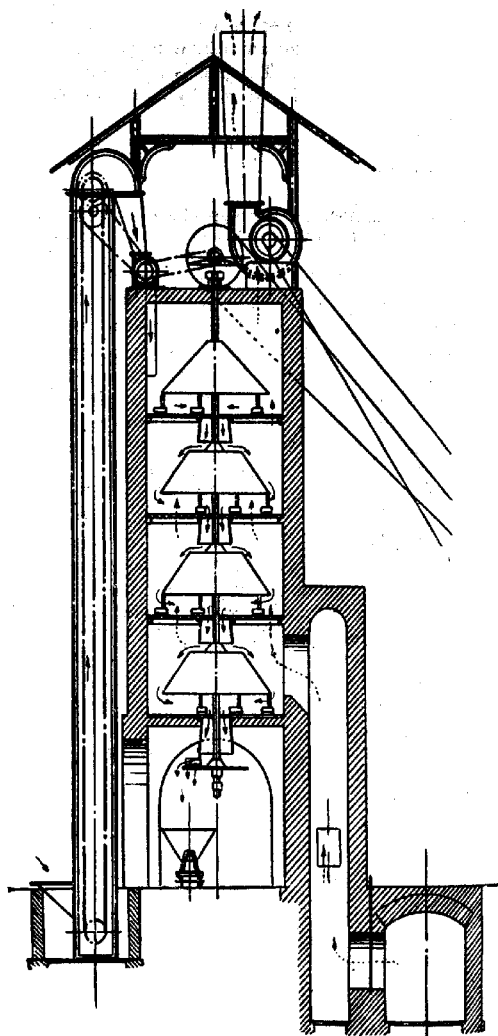
working with it. The essiccation is obtained by the direct products of combustion of the fuel contained in a small fire box, which by the action of a powerful ventilator are obliged to pass through a shallow layer of the grain to be dried. The grain is kept continuously in motion by a very ingenious stirrer. It is driven by a gin, portable or any other power engine.

At present the apparatus is built in two sizes which cost respectively £80 and £90.

- Continuous Drying Apparatus for Agricultural Industries. - DE COMBÉ in *Journal d'Agriculture pratique*, Year 77, Vol. 4, No. 20, pp. 632-634, Paris, May 15, 1913.

This esiccator consists, as is shown by the annexed figure, of a cylindrical tower divided horizontally by perforated plates. A shaft supports conical distributors over each plate. The heated gases enter at the lower extremity of the tower and rise to the top while the stuff to be dried descends, so that the warmest gas comes into contact with the driest stuff. Heat is generated in the fire place at the foot of the tower and is forced through the apparatus by an exhauster at the top. In the figure the direction followed by the stuff to be dried is shown by full arrows, that of the heated gases by dotted arrows. The temperature of the gases is regulated by the admission of cold air.

The Huillard esiccator used at the Nag Hamadi (Egypt) sugar mills given the following results: The weight of the stuff to be dried was 103 ½ tons. The degree of moisture on entering the apparatus was 81.5 per cent. and on leaving it 35 per cent. The weight of the water evaporated was therefore nearly 74 tons. The temperature of the stuff at its entry into the tower was 27.8° C; at its issue 52° C. The power required by the ventilator was 25 HP. and by the drying apparatus 5 HP.



Huillard's esiccator.

- Trial of a Groat Mill. — GRESLER in *Landwirtschaftliche Zeitschrift für die Rheinprovinz*. Year 14, No. 23. pp. 392-393. Bonn, June 6, 1913.

The results obtained during the trial of the mill are shown in the following table:

Cereals ground	HP. required	Lbs. ground per HP.	Cost of electricity in pence per cwt.
ry: coarse	3.50	161.0	07.2
medium	12.85	89.7	11.9
fine	9.10	82.7	13.1
: coarse	2.60	176.3	06.6
medium	3.80	161.2	07.2
fine	5.35	110.4	10.2
: coarse	7.80	129.3	08.4
at: fine	13.80	144.4	07.2
at: fine	8.30	112.4	10.2
: fine	13.35	164.6	06.6

General results: The groat mill size III gave the above results without trouble or drawbacks. Its management is very simple, its construction light and durable and the devices for lubricating are good. It costs 500 lbs (about £ 25).

- Apparatus for Smoking Meat etc. — MARTINY. B. in *Mitteilungen des Vereins landwirtschaftliche Maschinen Prüfungs-Anstalten*, Year 7, Part 1, pp. 1-5. Berlin, 1913.

This apparatus has been submitted to a two years trial at the Halle experiment station. It is built entirely of metal; The frame-work is of angle iron, the walls are of galvanised iron plates, the edges which are folded over each other and bolted. In the lower part of the apparatus a movable fire box is situated and contains the fuel, saw-wood twigs or wood shavings. By means of some vertical partitions fire is obliged to follow a serpentine course, and thus lasts longer. Behind the fire box and the space in which the meat is hung there is a double bottom of sheet iron enclosing a space in which the smoke is dried, cooled and distributed. The whole apparatus is set up near a chimney to which it is connected and which carries off the escape smoke. These apparatus are built in various sizes ranging from £2.10s to £12.10s.

The judgement passed upon these apparatus is the following: When smoking apparatus is easy to manage, it does not take up much room, it is durable and safe, it allows of a continuous production of smoke, and gives good uniformly smoked products. It is also suitable for keeping smoked meats. It can therefore be recommended for domestic use and for smoking meat and sausages and for storing the same.

977 - Review of Patents.

Machines for Tilling the Soil.

- 260 626 (Germany) Disk plough with cable traction.
 60 016 (Austria) Motor plough.
 60 203 (Austria) Motor plough.
 60 015 (Austria) Harrow with rotating implement shafts arranged obliquely to each other to the direction in which it travels.
 255 592 (Belgium). Motor plough.
 1 062 198 (United States). Subsoil plough.
 1 063 928 (United States). Plough.
 1 064 149 (United States). Combined Weeder and Cultivator.
 1 064 038 (United States). Harrow.
 454 864 (France) Improvement in one or multiple furrow balance plough.
 454 856 (France) Swing plough with helicoidal mould board.
 4 576 (England). Motor ploughs.
 5 558 (England) Harrows and cultivators.
 130 806 (Italy). Steam outfit for mechanical tilling of the soil.
 130 871 (Italy). System of ploughing with mould boards having a convex surface turned wardly.

- 128 529 (Italy). Device for automatically lifting and stopping harrows.
 60 436 (Switzerland) Motor plough.

Manure distributors

- 5 484 (England) Manure distributing machine).

Sowing machines.

- 251 499 (Germany). Sowing machine for beet and similar seeds.
 60 017 (Austria). Potato laying machine.
 60 022 (Austria). Drill with sowing wheels inside the hopper.
 1 062 766 (United States) Seed Planter.

Mowing Machines.

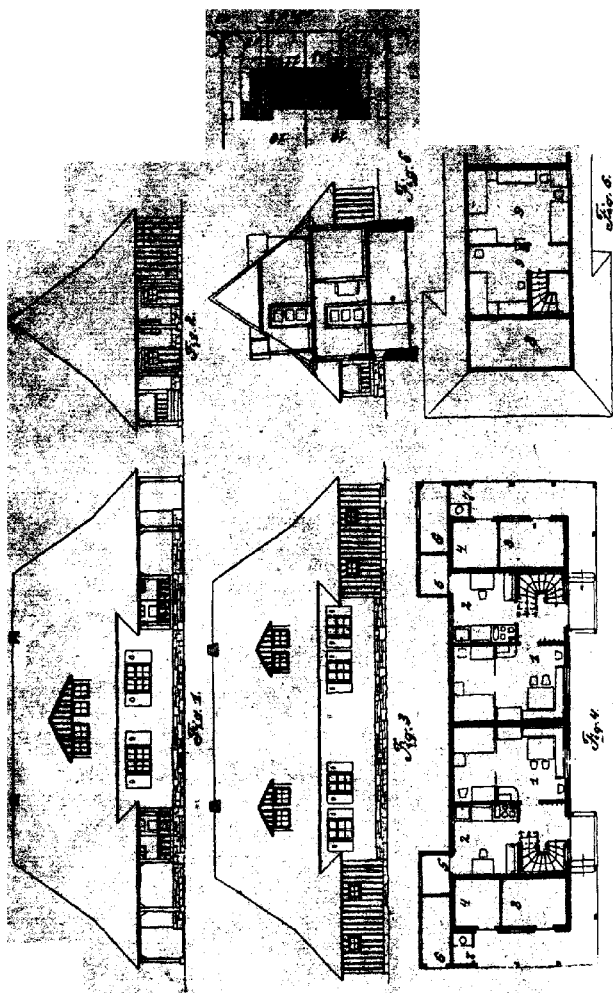
- 259 463 (Germany). Mowing apparatus for reeds.
 60 215 (Austria). Mower.
 1 063 305 (United States). Attachment for mowing machines.
 454 924 (France). Lawn mower.
 4 157 (England). Grain harvester and binder.
 60 250 (Switzerland) Auto-mower.
 60 437 (Switzerland). Knife for mower.

Machines for lifting root crops.

- 259 388 (Germany). Discharge wheel for potato harvester with oblique running thro
 60 223 (Austria). Beet lifting plough.
 255 501 (Belgium). Potato lifting machine.

Machines for cleaning grain and seeds.

- 1 063 834 (United States). Threshing machine.
 4 247 (England). Threshing machine.
 4 444 (England). Grain separating machine.
 130 805 (Italy) Cylinder and concave for threshing machine.



Other agricultural machines and implements.

- 3 (Germany) Device for pulling the tying material in straw presses (Annex to Pat. 259 317).
- (Austria) Coffee cleaning machine.
- 10 (United States) Grinding mill.
- 30 (United States) Milking machine.
- 45 (United States) Cotton chopper.
- 1 (France) Apparatus for sulphuring.
- England) Sheep dip.
- (Switzerland) Machine for sharpening scythes.

Prize Designs for Double Dwelling House for Agricultural Labourers.
 IRING, K. in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 35, pp. 428-429, Berlin, Jul 30, 1913.

In the special section of agricultural buildings, of the International Exhibition at Leipzig (1913) the designs shown on the annexed were awarded the first prize. The plan is very simple (kitchen and living room).

The stables are immediately adjoining the house. Thus, besides other advantages, a more compact and effective roof is possible. In front of the door and round the stables the roof is prolonged so as to give spaces for the pantry, shed and closet; the entrance is also so that the closet may be reached under cover. The house is provided with an underground cellar. It is situated a few yards back from the road, leaving space for a small garden and yard enclosed by a hedge along the road. The walls of the cellar are of stone, the rest of brick. The heating is so arranged that the heat produced by the kitchen fire can be utilized for warming the dwelling room and the bedrooms in the roof. The inner fittings of the house are very simple. The cost of such a house is about £ 170.

In the annexed plate the figures show respectively the front, side and back elevation, also ground plan, cross section, roof story and floor plan.

Fig. 4. (1) is the dwelling room, (2) the kitchen, (3) the goats' shed, (4) the pigsties, (5) and (6) pantry and implement room, (7) the stable. In Fig. 6, (8) is the hay loft and (9) the bedrooms. In Fig. 7, (10) the field, (11) the garden, (12) the yard and (13) the road.

RURAL ECONOMICS.

Dairying without Breeding: Researches on the Nature, Spread and Changes in the Factors of Profit in Dairying without Breeding, with special regard to the conditions of the Rhine Province and of Westphalia. — WÜSTENDORFER, KURT in *Landwirtschaftliche Jahrbücher*, Vol. 44, Part 4, pp. 529-639, Berlin, May 20, 1913.

The writer distinguishes two principal types of dairy farms, those that breed, that milk only (reine Abmelkwirtschaft) and those that breed and milk (Mischwirtschaft). Between these two there are intermediate forms. The principal difference between the two extreme forms consists in the way in which the stock is replaced: by purchase, or by breeding on the farm itself, in the

length of time that the animals stay in the farm, in the way the calves are utilized, and in the kind of feeding. Each form has its pros and its cons. The milking farm requires less, and less careful, work, it favours a rapid turnover of capital, it facilitates the adaptation of the production of milk to the demand, and it allows the most intense utilization of existing buildings while it furnishes excellent manure due to the consumption of large quantities of concentrates. On the other hand the danger from cattle diseases is very great and a number of good cows that would still be useful for breeding purposes are withdrawn.

As factors of the profitability of the above type of dairy farms, the writer mentions the conditions of labour, of the forage market and of the milch-cow market, the cost of production of milk and its sale price. He discusses the changes in these factors which he has collected in numerous tables from observations made during the last ten years in the Rhine province and in Westphalia, where this kind of dairy farms is fairly numerous.

The wages of day labourers, of farm hands, especially of Swiss stablemen have risen considerably. The difficulties with the farm servants and labourers (changes of situation, breach of agreements etc.) have increased considerably on account of the great industrial development of the district.

Concentrated foods have, on the whole, become much dearer, so that the greater cost per cow and per year due to this item amounts to £31 6d, as an average of 11 farms. This increase in the cost will be easily understood if one bears in mind that with the two-fold object in view: production of milk and of meat the consumption must be heavy both as to the nutritive elements and as to the protein contents. Some of these farmers indeed often carry the intensity of feeding beyond the limits of sound economy, so that, as may be seen from these observations, the feeding becomes irrational and the profits of the concern diminish, for here also the law of decreasing returns holds good. In this connection, both in the production of abundant and cheap forage by a better rotation of crops and in the selection of concentrates (with due regard to prices and to special effects there is room for a good deal of improvement.

For the aims of these milk farms only the best animals of those breeds that combine an abundant yield of milk and an aptitude for fattening are used. But the prices of good milch cows have, during the last decade, with the exception of a few bad years, increased extraordinarily owing to the greater demand, the claims of middlemen and the development in the breeding of pure races. Thus for instance the market prices at Dinslaken and Neuss have risen by an average of £6 5s or 39.7 per cent.

The greater expense thus caused by the purchase of the cows is partly compensated, other conditions being equal, by the increase, especially in the late years, in the price of the discarded cows sold to the butcher. The increase has been, on average, during the ten years between 1901-1910 and at the Cologne, Crefeld, Aix-la-Chapelle, Düsseldorf, Essen and Dortmund markets, of £1 12s per cwt. or 34 per cent. live weight. Nevertheless the "loss per cow" that is the difference between the purchase price and the sale price is greater now than it was ten years ago.

Besides the above causes, the modern hygienic requirements also tend to increase the cost of production of milk.

Among the causes which have acted against the increase in the price of milk the writer mentions the extension of the milk trade, due to the progress of technique and to the introduction of a sliding scale tariff for the carriage of milk by rail, the low cost of the production of milk in breeding districts situated at a distance from industrial centres and the activity of the organizations of the milk trade. Nevertheless, in consequence of the increasing demand, and perhaps also of the action of organizations of producers, in reality there has been an increase in the price of milk, to such an extent that no decrease of general and considerable profit is to be apprehended in these farms when situated in suitable localities and making good use of concentrated feeds. On the other hand, the writer considering the lower cost of producing milk and the high value commanded by milk in the breeding districts, considers it possible that the latter have become more profitable and have diminished the power of the milking farms of competing with them. In selecting between these two types of farms the following factors are the weightiest.

1. The price of milk and the position of the farm as to means of communication.

2. The personality of the manager of the farm.

3. The size of the farm.

4. The quantity and the quality of the available forage, not possessing market value, which is produced by the farm, and of the by-products of agricultural industries.

5. The existing and the possible proportion of meadows and pastures. In milk farms, without breeding, the amount of labour and of capital expended by every head of cattle is considerable, consequently adequate net returns are only possible where the gross returns are also high, that is, where the price of milk is high. This price cannot be determined in general, owing to the very varied economical conditions of the several farms and positions as to facility of transport.

6. The position of the farm as to means of communication, as well as the capacity of a milk farm to stand competition diminishes the more it is located from a market.

The proper management of a milk farm requires a thoroughly capable manager. He must know how to value the aptitude of a cow to produce milk. He must be able to hold his own against the dealer and he must stand feeding animals so as to make the best of the conditions of the market of concentrated foods. These qualities, with the exception perhaps of the first are generally more often found among the large farms than among the small ones. Even in the selling of milk and in the buying of cattle, the former enjoy a certain superiority over the latter and are often completely at the mercy of the dealers.

7. The quantity and the nature of the by-products of agricultural industries are of decisive importance in the selection of the type of farm when concentrated feeds are to be utilized in one's own farm. The feeding of large quan-

titles of fresh or ensilaged beet root pulp, beet root leaves and rye distilling wash can easily be more injurious to cows in calf than to milch cows; they may sometimes, when no drying apparatus is available induce a manager to turn his farm into a milk farm and in some cases even lead him to do so.

Not only the actual, but also the possible proportion of pasture and meadow to arable land must be taken into consideration in selecting a type of farming to be adopted; the climate (amount of rainfall) and the conditions of the soil determine the possibility of laying down pastures which are perhaps already necessary for the success of the partial milk farms in which the best cows are put to the bull once or twice) and are absolutely indispensable in the partially and wholly breeding farms.

During the last ten years the increase and decrease of the number of these two types of farms in the Rhineland and Westphalian industrial districts has been the following: from 1904 to 1907 a great increase of breeding farms took place, without however any diminution in the milk farms; in 1908 there was an increase in the number of milk farms at the expense of the breeding farms; in 1909-1910 the latter diminished both absolutely and relatively, without an absolute increase in the milk farms; in 1911 there was an increase of the former and a decrease of the latter. Whether the decrease is due to economical reasons or to the exceptional character of 1911 will not be conclusively known until the figures for 1912 and 1913 are available. Should these figures show a further absolute and relative increase in the number of young cattle, it will be demonstrated that the economical limit of the milk farms had been considerably overstepped during the years 1908-1910 and that the economic changes in the cattle and milk markets have induced farmers to change the type of a farm where milk farming was no longer advantageous.

980. - **The Butter Problem.** CARTER PLATTIS, W. in *The Field*, Vol. 121, No. pp. 628-683, London, April 5, 1913.

A few years ago, at the cost of £. 1600, Major R. F. Roundell equipped a modern dairy on his estate at West Marton, near Skipton (Yorkshire). It was established not as a profit-making concern for the owner, but for the benefit of his tenant farmers. The books have been open to the public for the purposes of the above article.

A large portion of the milk, amounting to almost half the total received, is sold again as fresh milk and the bulk of the remainder is separated for butter making, there being a good market for the separated milk in the poorer parts of the industrial centres. Cream and cheese are also made, and all waste products are consumed by pigs.

The milk is bought at 5 $\frac{3}{4}$ d. per gallon in summer and 7 $\frac{1}{2}$ d. per gallon in winter; these prices are low, but there are certain compensating advantages from the farmers's point of view in being able to dispose of their total milk produce.

During the last completed working year, 98 636 gallons were received from farmers occupying 1676 acres of grass land. Of this, 44 160 gallons were sold as new milk and 836 galls. were made into cheese; the

separated and produced 3 310 $\frac{1}{2}$ galls. of cream; 2 552 $\frac{1}{4}$ galls. of cream made into 13504 lbs. of butter and 32 837 galls. of separated milk also sold. The Profit and Loss account for the same period shows following figures:

	£	s	d
Purchases	2865	2	6
Working expenses	590	10	4
Depreciation of plant	99	9	0
	£ 3555	1	10
Total Receipts	£ 3847	16	7 $\frac{1}{2}$

When book debts and values of stocks had been adjusted, a net profit of £188 1s 4 $\frac{1}{2}$ d was shown; while half this sum was put into a reserve fund, the remainder was distributed as bonuses amongst the tenant farmers, being equal to an additional farthing per gall. on the price of the milk they had brought in.

The Economic Causes of Decreased Milk Production in Austria-Hungary. — BELBECK, ALFRED R. in *Milchwirtschaftliches Zentralblatt*, Year 42, Part II, pp. 338-341. Hannover, June 1, 1913.

The writer attributes the decrease in milk production in Austria-Hungary to the declining interest displayed by farmers in cattle raising consequent upon the great rise in the price of food stuffs, and also to the large outlay of capital required for modern dairy equipment. The same reasons caused the small holders to abandon the industry, and led to its gradual concentration into the hands of the large producers and in the districts which are more favourably situated as regards means of communication. The means of increasing milk production the writer recommends the encouragement of cattle breeding, especially with regard to pure bred and good milk yields, by means of societies for the control of milk, and the adjustment of the price of milk by the agency of town councils to which the milk can be consigned.

Intensive Feeding of Milch Cows. — HÖCKNER. Ist intensive Milchviehfütterung nach Leistung auch in einem Zuchtstalle ohne Schädigung der Zucht durchführbar und rentabel? — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 32, pp. 388-389, 1913, p. 33, pp. 403-404, and No. 35, pp. 429-430. Berlin, April 19, 23 and 30, 1913.

Since February 1910, the writer has been practising on his estate of Enzinne near Freiberg in Saxony the intensive feeding of milch cows according to their performance. The animals were divided into two groups, and Kellner's system was followed.

In the present article he gives the advantages accruing from this method of feeding his animals, viz.: greater regularity in milk production, lengthening of the lactation period, better health and condition, less loss from abortion, reduced mortality among the calves, higher money return per cow, saving in bulky food. In conclusion, the writer gives the expenses and returns according to his cow-keeping books for the years 1909, 1910, 1911 and 1912 (up to October 1): See table pp. 1282-3 (1).

) As the results for 1912 deal with only 9 months, we have only given the data for 1909, 1910, and 1911. (Ed)

Cow-Keeping Expenses.

1909	1910	1911
1. Bulky food. a) Winter: 6 kg. hay at 5 M. per quintal. 0.30 M. Distillers' waste 0.08 " 12 kg. mangels at 1.4 M. per q. 0.16 " 5 kg. straw at 3.00 M. 0.15 " 155.40	1. Bulky food. a) Winter: 6 kg. hay at 5 M. per quintal 0.30 M. Distillers' waste 0.08 " 12 kg. mangels at 1.4 M. per q. 0.16 " 5 kg. straw at 3.00 M. 0.15 " 155.40	1. Bulky food. a) Spring: 140 days at 0.74 M. 103.60 b) Summer: 40 kg. clover at 1.6 M. per q. . 0.64 M. 3 kg. straw at 4 M. 0.12 " 123.86
b) Summer: 50 kg. clover at 1.20 M. per quintal 0.60 M. 2 kg. straw at 3.2 " 0.08 " 105.40	b) Summer: 50 kg. clover at 1.20 M. per quintal 0.60 M. 2.5 kg. straw at 3.2 " 0.08 " 105.40	c) Autumn: 4 kg. hay at 8 M. per q. 0.32 M. Distillers' waste 0.16 " 10 kg. straw at 3 M. 0.30 " 5 kg. straw at 3 M. per q. 0.15 " 70 days at 0.97 " 67.90
2. Concentrated food. for 66 cows Wheat bran 106.76 Crushed Russian barley 865 Pea-nut meal 1482 Brewer's grains 55.13 Dried sugar beet slices 177.00 Dried potato flakes 13.30 Best linseed meal 43.75 Sesame meal 5.30 Palmnut meal 53.60 Malacca 4.14 Cottonseed meal 4.44 284.44	2. Concentrated food. for 58 cows Wheat bran 150.30 Crushed Russian barley 71.20 Pea-nut meal 148.00 Brewer's grains 6.68 Dried sugar beet slices 41.00 Dried potato flakes 60.50 Best linseed meal 80.35 Sesame meal 105.15 Palmnut meal 10.70 Malacca 1.34 Cottonseed meal 1.64 584.44	2. Concentrated food. for 58 cows Wheat bran 150.30 Crushed Russian barley 71.20 Pea-nut meal 148.00 Brewer's grains 6.68 Dried sugar beet slices 41.00 Dried potato flakes 60.50 Best linseed meal 80.35 Sesame meal 105.15 Palmnut meal 10.70 Malacca 1.34 Cottonseed meal 1.64 584.44

<p>Wages, allowances, milk prices 45.00</p> <p>Rent of stable, 4% on 500 M. 20.00</p> <p>Interest on capital expended on cows 20.00</p> <p>Losses (cows) 2 350 M.</p> <p>Losses (calves) 280 "</p> <p>Veterinary 280 "</p> <p>2 770</p> <p>for 66 cows, per head 41.97</p>	<p>Wages, allowances, milk prices 45.00</p> <p>Rent of stable, 4% on 500 M. 20.00</p> <p>Interest on capital expended 20.00</p> <p>Losses (cows) 2 350 M.</p> <p>Losses (calves) 280 "</p> <p>Veterinary 280 "</p> <p>2 770</p> <p>for 64 cows, per head 35.47</p>	<p>Wages, allowances, milk prices 45.00</p> <p>Rent of stable, 4% on 500 M. 20.00</p> <p>Interest on capital expended 20.00</p> <p>Losses (cows) 2 350 M.</p> <p>Losses (calves) 280 "</p> <p>Veterinary 280 "</p> <p>2 770</p> <p>for 38 cows, per head 32.76</p>
<p>4. Cost of milk.</p> <p>Upkeep of utensils 5.00</p> <p>Wages and expenses per week:</p> <p>Horse 42.00 M.</p> <p>Milk-maid:</p> <p>Wages 7.50 M.</p> <p>Lodging, firing 1.50 "</p> <p>Board 6.00 "</p> <p>52 X 57.00</p> <p>= 2 964 M. for 66 cows, i. e. per head 44.91</p>	<p>4. Cost of milk.</p> <p>Upkeep of utensils 5.00</p> <p>Wages and expenses per week:</p> <p>Horse 42.00 M.</p> <p>Milk-maid:</p> <p>Wages 7.50 M.</p> <p>Lodging, firing 1.50 "</p> <p>Board 6.00 "</p> <p>52 X 57.00</p> <p>= 2 964 M. for 66 cows i. e. per head 45.31</p>	<p>4. Cost of milk.</p> <p>Upkeep of utensils 5.00</p> <p>Wages and board per week:</p> <p>Horse 42.00 M.</p> <p>Wages 8.30 "</p> <p>Lodging, firing 1.50 "</p> <p>Board 6.00 "</p> <p>52 X 58.00</p> <p>= 3 016 Marks, for 38 cows i. e. per head 52.00</p>
<p>Total 554.45</p> <p>Less value of manure 90.00</p> <p>Expense per head 46.45</p> <p>Gross returns 478.00</p> <p>Gain per head 13.55</p>	<p>Total 579.38</p> <p>Less value of manure 90.00</p> <p>Expense per head 48.36</p> <p>Gross returns 516.59</p> <p>Gain per head 27.01</p>	<p>Total 656.82</p> <p>Less value of manure 90.00</p> <p>Expense per head 566.82</p> <p>Gross returns 586.56</p> <p>Gain per head 15.74</p>

1 kilogram (kg) = 2.2 lbs. — 1 quintal (q) = 220 lbs. — 1 Mark = 11 1/4 z.

- 983 - The Adaptation of Sheep Farming to Modern Agricultural Methods. — BORNEMANN in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 43, pp. 397-398, Berlin, May 28, 1913.

The writer points out that extensive sheep-farming for wool is at variance with the modern intensive use of arable land, while intensive breeding of double purpose sheep with fat lamb rearing suits this practice very well and pays even on dear land. He gives as the results to be aimed at: early maturity, fairly homogeneous wool, fertility and deep milking. These are to be obtained by strict selection, and the crossing of German native breeds with English mutton breeds, a second lambing season, and good regular grazing.

- 984 - The Cost of Keeping a Heifer up to its first Calving. — 1. STAKEMANN in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 49, p. 593. Berlin, June 18, 1913. — 2. STABILINI, CARLO in *Giornale di Agricoltura della Domenica*, Year 23, No. 25, p. 192. Piacenza, June 22, 1913.

The writers calculate the cost of keeping a heifer up to the time it drops its first calf as follows:

1) Stakemann:	£	s	d	£	s	d
Value of calf	1	10	0			
45 days whole milk, 5 $\frac{1}{2}$ quarts per day	1	6	6			
20 " " " 3 $\frac{1}{2}$ " " "		7	9			
20 " skimmed milk 3 $\frac{1}{2}$ " " "		1	6			
60 " " " 5 $\frac{1}{2}$ " " "		7	0			
50 " 1 lb. oats; $\frac{1}{2}$ lb. linseed; $\frac{1}{2}$ lb. hay		9	3			
250 " 3 $\frac{1}{2}$ lbs. hay; 5 $\frac{1}{2}$ lbs. oat straw; 2 $\frac{1}{4}$ lbs. concentrated foods	3	17	3			
100 " 3 $\frac{1}{2}$ lbs. mangolds at 12s per ton,		1	9			
Cost during first year				8	0	0
200 " 5 $\frac{1}{2}$ lbs. hay; 8 $\frac{3}{4}$ lbs. straw; 2 $\frac{1}{4}$ lbs. concentrated.	4	4	3			
165 " grazing	1	19	3			
Service		2	0			
Cost during second year				6	6	6
Keep during 9 months gestation	4	8	3			
Cost during third year				4	8	3
For attendance, stabling, etc., for 3 years	1	14	6			
Risk of disease, 5 per cent. for 2 years.		14	9			
General expenses				2	9	3
Total cost at calving				21	4	0

The writer observes that in herds where the breeding is very carefully tended to the cost may be somewhat higher than the above, while where less care is bestowed it may be somewhat less.

2) *Stabilini*:

	£	s	d
One of calf weighing 88 lbs. at £2 os 4d per cwt.	1	12	0
1 1/2 gallons of milk at 6.94d per gal.	6	3	9
1/4 cwt. hay at 2s 9d per cwt.	1	4	0
1/2 cwt. litter at 1s 8d		15	3
3/4 cwt. green food at 4 3/4 d per cwt.		6	0
Endurance and risk		12	6
Cost during first year	10	13	6
Cost of keep during the succeeding two years	9	2	6
Cost of cow at the age of three years	19	16	0

- The Cost of Production of Wheat. — LAURENT, FÉLIX in *Société Centrale d'Agriculture du Département de la Seine-Inférieure*, Year 153, New Series, No. 21, pp. 118-125. Rouen, 1913.

The writer calculates the cost of production of wheat for the three different degrees of intensity of farming as follows:

	Extensive culture, per acre			Medium culture, per acre			Intensive culture, per acre			
	£	s	d	£	s	d	£	s	d	
Interest on working capital	19	3	1	5	9	1	12	2		
Preparation of the soil before sowing	3	10		4	10		5	9		
Manure	8	0		12	10		16	1		
Seeds	19	3	1	0	10	1	1	2	6	
Planting	1	12	2	1	15	4	1	18	7	
Adding artificial and sowing	—			9	8		19	3		
Working the soil after sowing	16	1		17	8		19	3		
Harvesting and binding	2	7		4	10		6	5		
Stacking and carrying	1	7		3	3		4	10		
Threshing and cleaning	9	8		11	3		12	10		
Harvesting	6	5		8	0		6	5		
Harvesting	16	1		17	8		12	10		
Harvesting	2	3		3	3		3	10		
Total expenses	9	8		16	1		1	4	0	
Total expenses	£	7	6	10	9	11	3	11	4	9
Average crop of straw (cwt. of 112 lbs.)	22.3 cwt.			27.9 cwt.			31.9 cwt.			
Weight of straw to be deducted	£	1	7	0	1	13	9	1	18	7
Net cost of production of wheat (grain)	£	5	19	10	7	17	6	9	6	2
Average crop of wheat (bushels of 60 lbs.)		21	bu.		30	bu.		37	bu.	
Net cost per quarter of wheat		45s	10d		42s	2d		40s	0d	

The writer justifies the reliability of the prices given to the several items in the different degrees of intensity of cultivation and draws the following conclusions from the results. Prices of wheat of about 45s per qt. are, in good years, remunerative for the active farmer; but as in calculating the average cost of production only average values may be taken, so must average prices be taken in calculating the profit; the average price of wheat on the Paris Exchange in the years 1902-1911 was 40s 14 per quarter.

Intensive farming is in the production of wheat much more advantageous than extensive farming. Through the continuously increasing yield per unit of area due to the improved methods of cultivation the total production of wheat is yearly increasing. This increase of total production is however hindered by the diminution in the acreage under wheat, due to the transformation of arable land into pastures and meadows and to the change of rotation from the three years' to the four years'.

986 - **The Most Favourable Time for the Yearly Closing of Farm Accounts.** - BACKMAYR-HEYDA, L. V in *Monatshefte für Landwirtschaft*, Year 6, pp. 161-173, Vienna, June 1913.

The question as to the most favourable time for closing the yearly accounts of the farm should be examined according to the writer from the following points of view.

1. When is it that the farmer, without neglecting other important matters, can devote his time to book-keeping?
2. What are the objects aimed at by his retrospective accounts?
3. When is it that the farmer has reliable figures concerning the success of his farming which allow of no doubt?
4. How can the yearly balance be made to coincide most favourably with other book-keeping so as to avoid doing the work twice?

The writer then discusses these various points and reaches the following conclusions:

1. In the temperate zone of Central Europe the most favourable time for closing the accounts is the winter, that is to say when vegetation is at a standstill.

2. Through the closing of accounts the farmer can recognise the errors that he has committed in the management of his farm so as to avoid them in future and render his undertaking more profitable. Consequently it will be well to close the accounts after the close of the harvest of the product which has the most decisive effect on the success of the farm.

3. The writer discusses this point at length; he treats of the various phases of the calculation of net returns and lays stress on the great difficulties which attend the valuation of those products which have no sale on the market and of standing crops at different periods of the year. From this point of view the most favourable moment would be that in which the error in the calculation of net returns due to doubtful valuation of unsaleable produce, of standing crops, etc., would be smallest; this is the case when the local value of these products is at its lowest. But in most farms this moment is not the same for the unsaleable products and for the standing

ops, for just before the harvest the value of the first is at a minimum, while the latter are at their maximum. Considering the increasing difficulties of valuing standing crops the nearer the harvest is, it appears that it would be most advantageous to fix the time of closing the accounts when the stock of unsaleable farm produce is no longer very great and at the same time the value of the standing crops can still be approximately valued by the cost of production.

4. The yearly closing of accounts should also coincide with the drawing up of the estimates for the following year; consequently it should take place at a time when the farmer, on the basis of his stock of produce (wheat, forage and litter) and of the quantities of seeds and manures required by his rotation, can estimate his cash income and outlay. Consequently, and also to avoid doing the work twice, it will be well to close the accounts in winter or at least before the beginning of the spring cultivation.

From these considerations the writer comes to the following conclusions. The yearly closing of accounts cannot be carried out in all farms at the same time, irrespective of their climatic and economic conditions, if a reliable calculation of net returns is desired. In every farm that produces only crops almost exclusively of a nature that allows of their sale in the market, the best time for closing the accounts is shortly after the end of the period during which the chief items are produced and before the beginning of a new period. But also in those farms which produce a greater quantity of products that do not find a ready sale on the markets, it would be well to investigate carefully if there are good grounds for the current opinion, according to which the books ought to be balanced at the end of June, so as to avoid the difficulty of valuing those products which are not easily sold on the market and to have the calculation of the net returns free from all errors due only to estimation.

- **The Net Returns of Farms connected with the Book-keeping Association at Königsberg in Prussia.** — GÜNGERICH. Die Wirtschaftsstatistik der Landwirtschaftlichen Buchführungs-genossenschaft zu Königsberg in Preussen. — *Georgine*, Year 6, No. 45, pp. 338-339. Königsberg, June 5, 1913.

The results of the book-keeping of the farms affiliated to the Königsberg Book-keeping Association for the period 1904-1912, in their relation to income and outlay of cash and net returns per acre of agriculturally utilized land have been collected by the writer in the table on p. 1288.

The average net returns show a great range from year to year; thus for instance the year 1911-12 shows an increase of 160 per cent above the average of the net returns for 1907-08, and 75 per cent above the average of the preceding 7 years. Still further apart are the returns of the various farms. From this it may be seen how important it is to estimate the profitability of a farm and its value according to returns only after a long period of book-keeping.

If the net returns of the last year, 1911-12, be grouped according to the extent of the farms, it will be seen from the following that the net revenue increases inversely with the extent.

Year	Number of farms	Net returns per acre	Receipts per acre	From stock keeping	Sale of produce per acre	Strawberries per acre	Expenses per acre	Purchase of live stock per acre	Manures per acre	Foodstuffs per acre	Salaries and wages per acre	Upkeep of buildings and implements, p. acre	Supplies per acre	Wages in kind (wheat)
1904-05	18	18 6	54 4%	29 9	21 5	3 2	37 3%	9 1%	2 4%	3 11 1/4	11 10%	3 11 1/4	5 11%	2 11 1/4
1905-06	45	16 9	68 3	39 1	17 5%	12 8%	50 9%	13 6	3 2	5 2	11 10%	3 11 1/4	13 1	3 6%
1906-07	57	19 4%	79 9	44 5%	23 5	11 10%	59 1%	17 0%	3 6%	6 4%	13 6	5 2	13 6	3 11 1/4
1907-08	70	11 4%	63 5%	38 5%	15 10%	9 1%	54 9	11 10%	3 2	6 9	15 5%	4 9	12 8%	4 9
1908-09	74	13 11 1/4	67 10	38 5%	18 7%	10 8%	55 11%	11 10%	3 11 1/4	7 1%	15 10	4 9	12 3%	5 2
1909-10	89	19 3%	75 9%	42 10%	25 4%	7 6%	57 1%	12 8%	4 4%	7 6%	16 3%	4 9	11 6	4 9
1910-11	96	15 9	73 9%	46 9%	19 10	7 1%	59 11	13 1	4 9	8 4	16 8	5 2	11 10%	4 9
1911-12	118	28 9%	90 10%	48 4%	34 11	7 6%	64 3%	13 6	6 9	9 6%	17 0%	5 11 1/4	11 6	5 4%
Average	...	17 11 1/4	71 9%	40 10%	22 3%	8 8%	54 9	12 10%	3 11 1/4	6 9	14 10%	4 9	11 6	4 4%

Number of farms	Extent: acres	Net returns per acre
.....	up to 618	£ 1 11 s 1 ¼ d
.....	618 to 1236	£ 1 10 s 0 ¾ d
.....	1236 to 1854	£ 1 7 s 3 ½ d
.....	above 1854	£ 1 2 s 7 ¼ d

The average net returns give, on capitalizing at the rate of 4 per cent., average capital value of $17s\ 10\ 1/4\ d \times 25 = £22\ 6s\ 4d$ per acre, a price which has already been considerably exceeded by recent prices of property.

The income and outlay of cash has increased yearly; the total outlay in the year 1911-12 exceeds that of 1905-06 by 30 per cent. This increase chiefly due to the higher wages and to the increased use of chemicals. The wages in cash per acre of cultivated land have increased by 30 per cent., and together with the wages in kind (wheat), by 50 per cent. The outlay on manures has risen by 180 per cent. and on foodstuffs by 140 per cent.

This increase of intensity that becomes visible in the increased figures of the cash account has a very satisfactory economic result in the considerably increased production of live stock and of wheat; but the result to the estate economy is not so satisfactory, because the net returns of the farm have not increased at the same rate as the intensity of farming. The cause of this inequality between the increase of intensity and that of the net returns, in spite of the fact that the prices of the means of production, such as foodstuffs, manures, farm machines and implements, have remained stationary or have even sunk, while the prices of live stock and its produce as well as wheat have considerably risen of late years, are attributed by the writer to the great rise in the prices of landed property and to the fact that the capacity of the managers of farms is not yet on a level with the great demands of intensive farming.

- Italian Emigration in 1912. — *L'Agricoltura Italiana*, Year 9, Series 4, Part 10, pp. 297-299. Pisa, May 31, 1913.

The total number of emigrants from all parts of Italy was larger in 1912 than in 1911, the greatest increase in numbers in proportion to population being from the Marches, Calabria, Sicily, the Abruzzi, Basilicata and Apulia. As in former years, the emigrants from Northern Italy mostly went into other European countries, while those from the south chiefly sought their fortunes beyond the seas. Most of the emigrants consist of agricultural labourers, shepherds, day labourers, masons, iron workers and other industrial workers. The better educated classes were only represented.

In 1912, 308 140 passports were made out for European countries as against 271 065 in 1911; the surplus, numbering 30 405 individuals, went chiefly to France, Germany and Austria-Hungary. The number of emigrants to North and South America was 399 713 in 1912, as against 260 372 in 1911. In both years the largest numbers went to the United States, the numbers rising from 191 087 to 267 637. The number of emigrants to Canada rose from 9094 to 18 991, of those to Argentina from 32 719 to 72 154, of those to Brazil from 22 287 to 35 562, to Chile, Peru and Bolivia from 1061 to 1530, and to Central America from 1116 to 1438. On the other hand the number of emigrants to Mexico fell from 1020 to 758, and that of emigrants to Uruguay and Paraguay from 1988 to 1643. Owing to the annexation of Libya, the emigrants to Africa increased by 8332, while 8 and 394 fewer went to Asia and Oceania respectively.

The numbers of emigrants coming from the different districts of Italy in 1912 were as follows:

District	Emigrants to European countries	Over sea emigrants	Total
Piedmont	38 556	26 688	65 244
Liguria	3 043	5 823	8 866
Lombardy	59 059	16 377	75 436
Venetia	96 842	17 275	114 117
Emilia	27 153	8 616	35 769
Tuscany	27 484	13 455	40 939
Marches	14 072	18 355	32 427
Umbria	11 063	2 978	14 041
Lazio	2 688	15 185	17 873
Abruzzi	6 123	40 379	46 502
Campania	5 491	61 448	66 939
Apulia	4 344	28 845	33 189
Basilicata	546	14 322	14 868
Calabria	1 290	46 033	47 323
Sicily	5 514	87 274	92 788
Sardinia	4 872	4 259	9 131
Total	308 140	407 312	715 452

With a total population of 34 813 975 in 1912, there were 2044 emigrants for every 100 000 persons in Italy, as against 1539 in the preceding year.

The emigration to Tripoli rose from 1032 persons in 1911 to 7428 in 1912, viz. an increase of 6396.

989 - *The Strikes of Agricultural Labourers in Italy in 1911.* — *L'Agricoltura Italiana*, Year 9, Series 4, Part 10, p. 311. Pisa, May 31, 1913.

The number of agricultural strikes and of strikers in the different Regions of Italy in 1911 were as follows.

Districts	Strikes	Op.	Strikes
Piedmont	12		4 134
Lombardy	42		3 029
Venetia	13		2 281
Emilia	57		104 771
Tuscany	2		282
Marches	1		?
Umbria	5		2 873
Latium	6		1 190
Campania	1		47
Apulia	3		1 000
Sicily	6		3 131
Total	148		132 738

In those districts where there were fewest strikes the share system is general, viz., in Campania, the Marches, Tuscany and Latium, while it is comparatively rare in the districts where most strikes occurred: Emilia, Lombardy, Piedmont, etc.

5 - **Ways and Means of Indian Agricultural Development.** — DOBBS, A. C. in *The Agricultural Journal of India*, Vol. 8, Part 2, pp. 161-168, Calcutta, April 1913.

The writer is of opinion that the most effectual method of improving agriculture in East India is by substituting for the labour of men and animals the less costly and more efficient assistance afforded by agricultural machines. He hopes, therefore, that the Agricultural Department, which has hitherto been occupied in standardising seeds and popularising the best existing methods of cultivation, will now turn its attention to importing and popularizing agricultural machines, especially steam ploughs and traction engines. In sugar cane districts, the introduction of the steam plough promises excellent results, as the areas under this crop are extensive and the soil requires deep cultivation. An obstacle to mechanical cultivation in many districts is the prevalence of small holdings; here its introduction will have to be left to the operation of economic forces, assisted perhaps by the spread of the co-operative idea. The larger amount of energy available will doubtless be used in elaborating agricultural and forest products.

AGRICULTURAL INDUSTRIES.

1 - **Buffalo Milk Analysis** (1). — PAPPEL, A. in *The Cairo Scientific Journal*, Vol. VII, No. 78, pp. 63-67, Alexandria, March 1913.

In a communication on the composition and analysis of milk and butter Mr. Lucas pointed out that the interpretation of the analytical results

(1) See No. 1653, B. Dec. 1912.

is often difficult owing to the absence of standards based on a sufficient number of analyses of samples known to be absolutely pure.

Being convinced of the necessity of establishing these standards, the writer gives the results of a certain number of his analyses of buffalo milk.

The samples of milk were taken from cows which were examined at the same time by a veterinary surgeon in order to make sure that the milk analyzed was that of healthy and well fed animals and might be considered normal.

Each sample comes from several animals, usually six, and thus represents a normal average milk. The writer hopes it will be possible to have 8 to 10 samples examined in this way each month for at least one year and if other laboratories would join in this work he thinks it would be advantageous to use the same method everywhere and to express the results in an identical way, so that they can be readily compared. He therefore submits the results of a few analyses together with the method employed.

Specific Gravity.

Maximum	1.0346
Minimum	1.0315
Mean for the 14 samples:	1.0333

The specific gravity was determined at 15° C., Sprengel's pyknometer being used.

Total solids.

Maximum	18.71
Minimum	16.56
Mean for the 14 samples:	17.69

The results are given always on 100 grams. The writer describes three methods he used and which gave results differing only in the place of decimals.

Fat.

Maximum	8.61
Minimum	6.79
Mean for the 14 samples:	7.74

Adam's method was employed, using petroleum ether freshly distilled between 45° and 55° instead of ordinary ether.

For routine work Gerber's method can be employed, but as in buffalo milk the amount of fat is very high, it must be decided at what temperature the volume of fat shall be read. From the analyses made, the writer observed that the reading at 60° agrees better with Adam's method than the reading at 70°.

Lactose.

Maximum	5.05
Minimum	4.70
Mean of the 14 samples: 4.89 per cent (calculated as anhydride).	

The gravimetric method was used, the lactose being determined with pling's solution, using Soxhlet's modification.

The lactose was also determined with the polarimeter, but this method presents some drawbacks.

Proteins.

The nitrogen was determined by Kjeldahl's method.

Maximum	0.698
Minimum	0.587
Mean for the 14 samples	0.642

But the factor to be used to convert nitrogen into protein is open to question, as enough experiments have not been made to know whether usual factor 6.3 is correct for buffalo's milk. Using this factor the teins equal 3.70 to 4.37, and the mean for the 14 samples is 4.04. The ter hopes before long to be able to solve the question satisfactorily.

Ash.

The figures are obtained by calcination at the lowest possible temperature of 10 c.c. of milk.

Maximum	0.84
Minimum	0.70
Mean for the 14 samples	0.78

In the ash the alkalinity and the chlorine have been determined. The figures obtained are:

1) Chlorine calculated as sodium chloride.

Maximum	0.099
Minimum	0.070
Mean for the 14 samples:	0.078

2) The alkalinity is given in cubic centimetres of normal sulphuric acid:

Maximum	9.2 %
Minimum	7.6 %
Mean for the 14 samples:	8.4 %

Total Solids Not Fat.

This figure is always used in milk analysis, as differences are chiefly served in the amount of fat. For the other constituents the differences not great and therefore the total solids not fat is a nearly constant re.

Maximum	10.23
Minimum	9.43
Mean for the 14 samples:	9.87

Very often in routine work only the specific gravity and the fat are rmined and the total solids not fat are calculated using Fleischmann's aula. But for buffalo's milk the figures obtained with Fleischmann's aula are too high. In studying the figures obtained in the present

analyses the writer found a formula which in all the 14 cases has given a nearer result than Fleischmann's formula, and the application of this formula is much easier, as no tables are necessary.

The following is a practical example. Supposing a milk has given:

Specific gravity:	1.0328
Fat	8.6 per cent.

The total solids not fat equal:

$$\frac{32.8}{4} + \frac{8.6}{5} = 9.92 \text{ per cent.}$$

The application of this formula for the 14 samples has given:

Maximum	10.11
Minimum	9.50
Mean for the 14 samples:	9.87

that is to say the same figure as the writer obtained directly.

992 - **The Determination of Fat in Dried Milk.** - ROSCHKE in *Molkerei-Zeitung*, Year 27, No 50, pp. 977-978. Hildesheim, July 2, 1913.

The writer recommends for the determination of the fat contained in dry milk the following rapid method, devised at the Berlin Dairy Experiment Station (Versuchsstation und Lehranstalt für Molkereiwesen). To cubic centimetres of sulphuric acid (S. G. 1.82), 5 c.c. of water and 1 c.c. amyl alcohol are carefully poured in layers over each other in a usual Gerber's butyrometer. To this 1.133 gram of milk powder, weighed in a specially divided weighing funnel with rubber stopper, and 5 c.c. of water are added.

After vigorous shaking the butyrometer is left in a water bath at 6 to 70° C. (shaking it from time to time) until the liquid has become clear; then it is centrifugated for 15 minutes. The sample is again put into a water bath at 65° C.; the fat content is read off and multiplied by 10. To make sure that the fat has been completely separated it is well to centrifugate the sample again for 5 minutes after having read off the fat content.

This method has the advantage of being rapid and easy to carry out, and gives a clear separation of the fat and can be used for the most various kinds of dried milk. In order, however, to obtain exact results the process as indicated by the writer must be strictly followed.

993 - **A Comparison of the Acid Test and the Rennet Test for Determining the Condition of Milk for the Cheddar Type of Cheese.** - HASTINGS, E. B. and EVANS, ALICE C. - U. S. Department of Agriculture, Bureau of Animal Industry Circular 210, p. 6. Washington, April 1913.

In the making of the Cheddar type of cheese it is desirable that the condition of the milk be such that the whey can be drawn from the curd at the expiration of approximately the same time each day. To control this the cheese-maker must be able to ripen the milk to approximately the same point each day. Two tests are employed to determine the ripeness

re milk, the rennet test in one or other of its modifications, and the test or the titration of the milk.

From the work effected by the writers, it is evident that, for the purpose of determining the ripeness of milk for cheese making, the rennet is superior to the acid test.

Use of Prickly Pears for Alcohol Production. — CETTOLINI, SANTE in *Società degli agricoltori italiani, Bollettino quindicinale*, Year XVIII, No. 12, pp. 456-459, Rome, June 30, 1913.

The writer recalls the experimental results obtained some years ago by Janna and by Colladel, oenologist at the Oenological School at Catania, in their attempt to distil prickly pears (*Opuntia*) which grow in the island without any cultivation. The fruit was small but heavy, averaging 3.6 oz. each, owing to the large number of seeds and the concavity of the pulp. When peeled, crushed, and submitted to pressure, 1 bushel yielded 26.8 galls. of somewhat viscous juice having a density 1.0548. Skins represented 37.64 per cent. of the weight and the seeds 18 per cent., leaving a little under 50 per cent. for the material to be used for alcohol extraction. The analysis yielded the following results.

Whole fruit:	albuminous substances	6.75 %
	oily	" 0.2758
	cellulose	" 1.342
Juice:	extractable material	15.54 %
	acidity	0.0102 "
	ash	0.692 "
	saccharine substances	11.20 "

It was remarked that the saccharine substances were essentially glycolic in character and present in sufficient quantity to be distilled directly, whereas the acidity was insufficient.

After a series of trials, the best results were obtained by squashing the peeled fruits and putting the pulp thus obtained into bags and pressing it to high pressure. The lack of acidity was then corrected by addition of 0.32 oz. of tartaric acid per gallon and the liquid inoculated with a good alcoholic ferment in very active condition. The fermented liquid contained 5.98 per cent. of alcohol, showing that the saccharine material was well utilized. By distillation and subsequent rectification it was obtained with a pleasant ethereal perfume which would make it suitable for various industrial purposes. The press cake could be used as stock food. It may be estimated roughly that 100 lbs. of figs produce 0.6 gal. of alcohol, and taking 120 cwt. of fruit as an average yield per acre, 80 gals of alcohol may be obtained per acre.

PLANT DISEASES

GENERAL INFORMATION

995 - Measures for the Prevention and Control of Plant Diseases in Italy.
Atti Parlamentari, Camera dei Deputati (No. 1430-1430 A), *Senato del Regno* (No. 1142 A), 1913.

The Chamber of Deputies and the Senate have approved in its respective sittings of June 14 and 22, 1913 the following law:

Art. 1 — The owners and managers of horticultural establishments and nurseries, who produce or trade in plants, parts of plants, and seed must notify themselves to the prefect of the province.

The Ministry of Agriculture, Industry and Commerce has the right to cause an inspection to be made of the cultivations and of the produce wherever they be kept, and to prohibit their sale if they should be found to be infected, or to order the necessary disinfection.

Art. 2. — The Ministry of Agriculture, Industry and Commerce may, by means of a ministerial decree:

a) suspend the importation into the Kingdom and the transit through it of plants or plant products if these be found to be infected;

b) determine the ports and the frontier stations through which only is the importation from abroad of living plants, seeds and other plant products allowed;

c) prevent the exportation of plants, parts of plants and seeds from the territory of communes in which the existence of infectious diseases has been ascertained.

Art. 3. — The delegates of the Ministry entrusted with the surveillance of the ports and frontier stations have the right to:

a) enforce the disinfection of plants, parts of plant and seeds which they may consider infected, as well as of the packing cases and any other object which may be a vehicle of disease germs;

b) prohibit the importation into the Kingdom, and transit through it, of plants which they consider infected or bearing germs of disease.

No indemnity is due for the disinfections or the prohibitions mentioned in this article.

Art. 4. — No indemnity is due for the trees, plantations, seeds or other plant products which might be injured or destroyed by the operations

ed out with the object of providing, according to the provisions of following article 5, for the protection of cultivated plants against use.

Nevertheless the Ministry may give special subsidies according to provisions contained in the Regulations, when the destruction of plants, is carried out in the farms of small peasant proprietors, or small sers who work with their own hands the said farms.

Art. 5. — The delegates of the Ministry of Agriculture, Industry Commerce have the right to enter into all farms, whatever be the crop s destination, in order to ascertain the existence of plant diseases and arry out, as set forth by the present Law and by the special Regu- ms, the disinfection and cure of the infected plants.

The Ministry of Agriculture, Industry and Commerce, having heard Commission for the protection of plants against disease, nominated he Royal Decree of October 25, 1911 (No. 1208) may render compulsory use of remedies against the diseases of plants and the use of means ontrol against insect and other plant pests, in cases in which the ef- ny of these means depends upon the united action of all those inter- d in such crops; it may further cause those treatments and destruc- s which it considers necessary to be carried out at the expense of e who fail or delay in carrying them out themselves.

6. — The owners of lands in which infectious diseases exist may e in communal, intercommunal and provincial associations (consorzi). The formation of these associations must be promoted by the exe- ve committee (giunta) of the communal or provincial council according hether the association be communal, intercommunal, or provincial, a it is demanded by a number of landowners who represent at least one of the cultivated acreage for which protection is demanded. The re- t has to be presented to the syndic in the case of communal associa- s, and to the president of the provincial council in the other cases. The constitution of these associations may be rendered obligatory he prefect after having heard the executive committee or committees he communes or of the provincial council, according as to whether a mmunal, intercommunal or provincial association be contemplated, and a the lack of such an association constitutes a disadvantage or a er to the protection of the interests of the agriculture of the district. The regulation to be issued for the application of the present law will orth the rules to be followed for the constitution, administration working of the associations.

The associations will be empowered to levy, in such a manner as shall ated in the Regulations, a yearly contribution not exceeding 15 7d acre on those landowners of the district who are concerned.

The provisions of the law for the collection of direct taxes, inclu- the fiscal privileges, shall be applied to the formation of the rolls of tributors and to the collection of their contributions.

The benefits arising from the present laws on the antiphyloxera as-

sociations (consorzi antifillosserici) may be extended to the associations of vine growers formed according to this law.

The antiphylloxera associations constituted according to the laws at present in force may act also for the diseases of other cultivated plants in their respective territories.

The powers considered in this article may in cases of urgency be extended also by a decree of the prefect, after having heard the bodies mentioned in the third paragraph, to associations of landowners which are already regularly formed.

Art. 7. — The State may take steps, at its own expense, for the direction of the work of protection against plant diseases, insects, and other plant pests, whenever it should deem it necessary, considering the nature and importance of the injury. It may also contribute up to one half the amount of the expenses of carrying out the necessary control.

The other half shall be defrayed by the parties concerned, but it may be advanced by the State, against reimbursement in one or more years by means of transfers to the collectors of taxes and of association dues or in such other ways as may be ordered by the regulation.

Art. 8. — Contraveners of the provisions of the present law and of the Regulations which will be issued in conformity with it, shall be liable to fines ranging between 8s and £7 18s 6d, without prejudice to further penalties which may be incurred for contraventions of the penal code.

Contraveners of the prohibitions of importation and transit shall be fined not less than 8s nor more than £11 17s 10d, without prejudice to further penalties which may be inflicted in accordance with the customs law on smuggling.

For the determination and definition of such contraventions, the provisions at present in force in the matter of customs are applicable.

Art. 9. — The funds voted in the budget of the Ministry of Agriculture, Industry and Commerce in chap. 40 of the year 1912-13 will be raised, in the same chapter of the year 1913-14 and in succeeding years, to £5470, in order to meet the outlay consequent upon the enforcement of the present law and the engagement of the staff according to Table B (1).

From the year 1913-14 the sum voted in chap. 71 of the budget of 1912-13 will be increased by £475 in order to meet the outlay according to Table A (2).

Art. 10. — The special laws on *Diaspis pentagona* of March 24, 1904, No. 130, and on *Doriphora* of May 30, 1875, No. 2517 (2nd series), are abrogated.

Art. 11. — The Regulation to be issued for the application of the present law will contain provisions for the organization of the services of

(1) Roll of the inspectors of plant diseases.

(Ed.)

(2) Roll of the employees of the Royal Station of Agricultural Entomology at Florence.

(Ed.)

veillance and warning, and of the prevention and cure of diseases, and the reimbursement of the sums advanced by the State on behalf of persons concerned.

- Order in Council on the Introduction of Potatoes into Western Australia.
Extract from *Government Gazette* of 19th April, 1913.

Whereas by "The Insect Pests Amendment Act, 1898," the Governor by order in Council may from time to time make such regulations as seems necessary for any purpose for which regulations are contemplated by the said Act, or which he deems necessary for giving full effect to the said Act: Now, therefore, His Excellency the Governor, by and with the advice and consent of the Executive Council, doth hereby revoke the regulations made under the said Act, and published in the *Government Gazette* on the 11th day of November 1911, and doth hereby make the regulations set forth in the Schedule hereto, and doth hereby declare that the said regulations shall come into force on the publication of this Order in the *Government Gazette*.

REGULATIONS.

1. All potatoes imported pursuant to the exception contained in the proclamation made under "The Insect Pests Amendment Act, 1898," and published in the *Government Gazette* on the 19th day of April 1912, shall be in new and sound bags branded with the name and address of the importer and the letter "P" not less than six inches long, and must be accompanied by a Government Certificate signed by an officer of the Department of Agriculture of the State from which the potatoes are imported, certifying that such potatoes are sound and were grown on a farm which has been free from Irish Blight for 12 months then last past.

2. All imported potatoes shall be subject to inspection at the port of entry by an inspector under the said Act.

3. The potatoes on arrival at the port of entry shall, at the expense of the importer, be delivered direct into a shed set apart by the Department of Agriculture, for inspection and such other treatment as may be deemed upon from time to time by the Inspector or other officer of the Department.

4. The importer or his agent shall, at the importers's expense, provide necessary labour to open the bags and to re-bag the potatoes, if passed for inspection, and in every way facilitate the inspection.

5. If the Inspector declares any imported potatoes to be diseased, infected with disease, the importer shall, at the request of the Inspector, at his own expense, disinfect, destroy, or otherwise dispose of such potatoes as the Inspector may direct.

6. Any consignment of potatoes being or having been in contact with diseased or prohibited consignment of potatoes may be destroyed, disinfected, or otherwise dealt with at the expense of the importer as the Inspector may direct.

7. A fee of One Shilling for every bag of imported potatoes shall be charged to defray the cost of inspection and of carrying these Regulations into effect.

8. Imported second-hand potato bags shall be disinfected at the port of entry as follows, namely: By dipping the said bags and keeping them continually submerged for not less than fifteen minutes in a solution of not less than one pound of bluestone to every ten gallons of water.

9. All bags or packages that have contained imported potatoes may be disinfected or destroyed or otherwise disposed of by the Inspector.

10. If any importer or his agent fails or neglects to observe these Regulations, or to carry out the requirements of any Inspector as aforesaid, the Inspector may destroy the potatoes or perform the work at the expense in all things of the importer.

997 - *Outline of Administration in Controlling Insects and Fungi Injurious to Agricultural Plants in Japan.* 32 pp., 1 fig. Tokio, 1913.

The first chapter of this publication of the Bureau of Agriculture, Department of Agriculture and Commerce, of Tokyo sets forth the nature of the task undertaken by the administration of the state in the control of insects and fungi injurious to agriculture. The necessary measures are carried out partly by the Imperial Government, and partly by the local governments. A list is given of the legislative measures and instruction emanating from the above-mentioned authorities.

The second chapter deals briefly with the entomological and pathological work pertaining to injurious insects and plant diseases which is carried out at the Agricultural Experiment Stations.

In the third chapter, are set forth the measures, adopted by Public Communities (self-governing organs from the prefecture to the village) and other Public Bodies, for the control of plant diseases and the special regulations respecting the export of rice, fruits, and plants. The fourth chapter speaks of the instruction in phytopathology given in the governmental communal or private agricultural schools, and in the institutes of various grades, and mentions the practical results of researches in this direction.

The fifth chapter continues the enumeration of the most important animal and plant parasites and gives the methods of their control.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

998 - *An Undetermined Pear Disease.* - PASSY, PIERRE in *Revue Horticole*, Year 8, No. 11, pp. 252-253. Paris, June 1, 1913.

Towards the middle of the summer, the sheath of buds in course of development loses its smooth, almost varnished appearance, and becomes dull; at the same time it takes a purple hue, and subsequently the epidermis becomes slightly warted. If the attack is slight, no further consequences ensue. The following year, the branches again show signs of the disease.

the epidermis is purple and wrinkled. If lateral quills occur they exhibit, shortly after the fall of the flowers, superficial scars covered with a somewhat wrinkled, suberous skin.

But the disease can assume a more serious character. From the first year, the attack can be more severe; and after the above changes have become very apparent the leaves of the buds cease developing and the lengthening of the bud axis is suddenly arrested, the dying off beginning at the top of the bud. The older branches which had not suffered much at first, become perforated and cracked; their appearance presents some analogy to that of victims of "tavelure", but in this case the cracks are usually longitudinal. Further, this cracking of the branches can be more marked, penetrate deeply and sometimes cause the death of old branches. Trees thus attacked grow very little, and if any fruits survive, they are much perforated and cracked; as a rule, they cannot develop, but turn black and are quite useless.

If, in the hope of saving a diseased tree, it be closely pruned, and all the possibly affected portions are removed, the buds which subsequently develop are attacked in their turn, and infected trees seldom, or never, recover.

The writer has observed this disease for more than 15 years, though has never before been recorded. The cases were at first isolated, but are now increasing: one row of 20 espalier "Doyenne du Comice" trees planted 20 years ago has been completely attacked. In spite of the researches which have been made to determine the cause of this disease, the pathogenetic agent is still unknown. The writer, however, thinks that we have here to do with a real parasitic disease, probably due to a bacterium. He bases his opinion upon the progress of the disease, its persistence on the trees affected, the visible modifications of the branches, and the reappearance of the malady after the removal of the diseased branches.

The disease shows itself alike upon trees planted on dry and on damp soil. The writer has observed it not only in the immediate neighbourhood of Paris, but elsewhere, many badly diseased trees being found in a consignment from Normandy.

The writer will continue his researches on the disease.

BACTERIAL AND FUNGOID DISEASES.

(1) - Experiments in Spraying Peaches and Vines in 1912 (1). — PANTANELLI, E. in *Le Stazioni sperimentali agrarie Italiane*, Vol. XLVI, Part 5, pp. 329-346. Modena, 1913.

Liquid concentrated polysulphides of calcium and barium kept in airtight sealed receptacles and diluted just before use, *i. e.* polysulphides as supplied by the trade, have proved in the course of experiments made in Latium in 1912, to be efficacious in the control of

(1) See also No. 1194, B. July 1912.

Exoascus deformans, peach leaf-curl, but quite useless in the case of *Plasmopara viticola* which attacks the leaves, flowers, and fruit of the vine. Unlike the polysulphides prepared on the spot and immediately applied these diluted concentrated polysulphides do not scorch the peach leaves, nor cause them to fall; they did, however, in one case scorch the youngest buds of some vines.

Scott's self-boiled lime-sulphur mixture (1) is efficacious as a spring remedy against *Exoascus deformans*, and was always useful in preventing peaches from being attacked by the rot due to *Monilia cinerea*.

Suspensions of iodide of copper are almost useless against *E. deformans* and cause many of the leaves to fall, but do not produce any visible scorching; suspensions of iodide of silver, on the other hand, are efficacious and were it not for their prohibitive cost, would be to be recommended on account of the ease with which they are prepared.

Silver soap emulsion (Vermorel and Dantony's formula) was of little use in 1912 in checking vine mildew (*Plasmopara*), while it had the disadvantage of being costly and slow to prepare, as the soap is difficult to dissolve.

The application of a suspension of "cuprosa" powder (the trade name for powdered oxychloride of copper prepared at the Bex factory) and of a wash made with Caffaro's "Pasta elettrocupriferà" (consisting chiefly of oxychloride of copper, but also containing lime and a considerable amount of water) were equally efficacious in checking vine mildew. The former has the advantage of being more quickly and accurately prepared; the latter, however, costs less than half as much. Both are good remedies against mildew, but give a rather smaller crop of grapes than is obtained with Bordeaux mixtures, as they have little or no stimulating effect upon the growth of the vine.

Comparing the results of 1912 with those obtained previously, the writer comes to the conclusion that Bordeaux mixture is to be preferred among washes containing copper, and cannot be replaced by sulphur mixtures, unless it be polysulphides (especially polysulphides of calcium prepared on the spot and immediately applied. For this purpose all the more or less concentrated, solid or liquid polysulphides, which now begin to flood the market, are not to be recommended. On the other hand, dilutions of ready-made commercial polysulphides of calcium and barium may be used for the spring treatment of peach trees as a remedy against *Exoascus deformans*.

(1) See Nos. 1534-1535, *B. May* 1911 and No. 423, *B. Feb.* 1912.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

o - Conservation of Vitality in the Seeds of Weeds buried deeply in the Arable Layer of Soil periodically tilled. — MUNERATI, O. and ZAFFAROLI, T. V. in *Le Stazioni sperimentali italiane*, Vol. XLVI, Part 3, pp. 347-371, 1 fig. Modena, 1913.

The writers, with the object of imitating as much as possible natural conditions, did not use in their experiments the porous pots used by other experimenters (Duvel, Snell, Dorph-Petersen). They placed the seeds at various depths, excavating small square holes and filling them up with the soil from the field, after having placed a cross of iron wire at a short distance above the seeds so as to be able to find them again easily.

The observations made enable the writers to state that, for the seeds of the great majority of cultivated or spontaneous plants, both those with hard teguments easily permeated by water and those having this quality in a lesser degree, "the power of conserving vitality possessed by seeds buried in the soil is strictly dependent upon the actual germinative faculty or readiness to germinate which they have at the moment when they are buried".

In other words, and speaking generally :

1) The readier a seed is to sprout at a determined time, the less it preserves its vitality in the soil, irrespective of the depth at which it is buried. The seeds of most cultivated species that have an immediate germinative faculty, do not remain alive in the soil: to such an extent is this the case that if they were left to themselves in the fields such species would disappear.

2) The longer the seeds of a given species keep in a condition unfavourable to germination, even under the most favourable conditions of moisture, air and warmth, the longer will these seeds remain alive in the soil, whether they be near the surface or ploughed deeply below.

3) The expression "Seeds that have rapidly lost their faculty of germinating in the soil" does not give a true impression of the facts as they take place in the soil. A seed may lose its germinative faculty out of the soil also and in surroundings in which most important factors for its evolution, namely water, be lacking. On the contrary it should be said, for cultivated and wild plants: "Seeds that sprouted soon after being sown in the soil and immediately died, or seeds which lost their vitality before germinating".

4) The power that the seeds of wild plants have of remaining inactive in the presence of the factor water changes more or less rapidly with time. Seeds with hard teguments gradually lose the faculty of preventing the penetration of water, and in other seeds, those conditions which allow water to perform its function of mobilizing matter successively gain ground. The slower a seed is to react to water, either in a granary or at a greater or

less depth in the soil, the more will the species be a pest. As soon as the seed of a wild plant ceases to oppose its primitive resistance to the action of water, its power of conserving its vitality in the soil does not differ from that of the seed of any cultivated plant. This is the reason of the fact that in the cultivated layer, germinating seeds are found at considerable depth and as much as one to two years after when they were buried.

5) In the long run the seeds remaining at a depth and not germinating end by finding in their forced habitat a state of equilibrium which would allow them to preserve their vitality almost indefinitely, but in normal conditions the implements of tillage interfere in time with this equilibrium.

6) The seeds which preserve their germinative faculty in the soil even if actually in condition to germinate easily, are those which require the action of light also in order to germinate: typical of this kind, among weeds, is charlock (*Sinapis arvensis*).

The lack of one or the other of the three factors, oxygen, moisture and warmth, which are commonly considered as determinants of the process of germination, is not sufficient explanation of the conservation of the vitality of seeds, because a covering of only a few inches of soil has the same protective action as a layer of 14 to 16 inches and upwards. Meanwhile either the seeds can germinate without light (and this is the case of most weeds of the lower valley of the Po) and then their germination will take place more or less regularly both in the superficial and in the deeper layers of the arable soil; or they require light and then they must remain wholly on the surface of the soil, because even a very slight tilling of the soil would prevent their germinating.

7) In practice, superficial or deep tilling of the soil, even if done frequently, has but a limited effect in the control of those weeds that are multiplied by seeds. If the seeds of weeds are not effectively prevented from ripening and falling to the ground, the control of weeds runs in a vicious circle and remains one of the most serious and difficult problems of intensive agriculture.

INSECT PESTS.

1001 - *Scydmaenus chevalieri* n. sp. in Senegal. — VUILLET, A. Description d'un *Scydmaenus* nouveau du Sénégal (Col. *Scydmaenidae*). — *Bulletin de la Société entomologique de France*, 1913, No. 9, p. 238. Paris, 1913.

The writer describes as new to science and under the name *Scydmaenus chevalieri*, a small beetle discovered at Kaolack (Senegal) by A. Chevalier. The beetle was found in fields of pea-nut (*Arachis hypogaea*) where it appeared to live on the underground fruits of this plant.

Septicaemia Produced by *Bacillus Melolonthae* and *B. Bombycis* in Cockchafer and Silkworms. — CHATTON, EDOUARD. Septicémies spontanées à coccobacilles chez le Hanneton et le Ver à Soie. — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 22, pp. 1707-1709, Paris, June 2, 1913.

In May 1912, the writer carried out some experiments on the pathogenic action of *Bacillus acridiorum* Herelle (1) on cockchafers; these insects showed signs of being affected by the virus, inoculated by punctures in the body cavity, and died between 24 and 48 hours after the infection. After having been attenuated by being used successively on different subjects without any intermediate culture, the virus, having remained pure, killed its victims in 12 to 24 hours, the average number of surviving females exceeding that of the males. But even the most virulent virus did not kill the cockchafers or even infect them if it only reached the insect by way of the mouth.

At the outset of the experiments, the writer noted the existence of a septicæmia in the cockchafer due to *B. melolonthæ*, which, though related to *B. acridiorum*, exhibits many points of difference both morphologically and culturally, being larger than the latter and showing fluorescence when cultivated for 5-6 days on agar, also having a pathogenic action on silkworms. In fact, while the larvae of the latter enjoy complete immunity against *B. acridiorum*, *B. melolonthæ* when injected appears as toxic to them. Cockchafers, though innocuous to both insects when merely ingested, *B. melolonthæ*, when of spontaneous origin, i.e. not cultivated artificially, injected into the body cavity of a cockchafer, kills it within 12 to 36 hours; if made more virulent by repeated cultures the virus destroys the insect always in less than 24 hours. The few cases of infection by ingestion noted in the experiments have not been tabulated and their percentage is greater than that of the spontaneous cases, viz. a mean of 5 a day. However, 75 per cent. of the healthy cockchafers have *B. melolonthæ* present in their digestive tubes, sometimes in dense cultures, and the parasite is invariably present in cockchafers suffering from septicæmia. The infection of the blood seems therefore to originate in the intestines and the parasite is habitually present in the alimentary tract of the cockchafer, but does not pass into the body cavity except under special conditions which are at present unknown. If taken from the intestine and inoculated directly into the body cavity into the body cavity, it produces septicæmia.

The writer also found another septic bacillus (*B. bombycis*) in the silkworm, which caused a daily mortality of 5 to 10 in a brood of 2000. It resembles the morphological characters of *B. melolonthæ* but does not produce fluorescence in agar; its virulence distinguishes it from *B. acridiorum*. *B. melolonthæ*, *B. bombycis* kills a silkworm in 12 to 24 hours after injection into the body cavity, and the writer was able to get infection by ingestion in the case of 4 individuals out of 27. It seems therefore to be more virulent than the two first-mentioned bacilli. It is, moreover,

1 See No. 750, B. April 1912.

much less common in the digestive canal of healthy silkworms than is *B. melonithae* in that of the cockchafer.

The disease produced by *B. bombycis* does not yet seem to be included amongst those that destroy silkworms. Until the death of the latter, no characteristic external signs of infection are visible. The writer proposes the name of "cocco-bacillosis" for this disease.

1003²¹ **New Ichneumonoida Parasite on Leaf-Mining Diptera.** — GARAN, A. I. in *The Canadian Entomologist*, Vol. XLV, No. 5, pp. 145-154. London, 1913.

A systematic description of 5 new species of the genus *Opius* (*O. melonithae*, *O. suturalis*, *O. aridis*, *O. bruneipes*, *O. succineus*) and of 2 new species of the genus *Dacnusa* (*D. scaptomyzae*, *D. agromyzae*) recognized as parasites of Diptera (*Agromyza parvicornis*, *A. pusilla*, *Agromyza* sp., *Scaptomyza flaveola*, *A. angulata*) living at the expense of the leaf parenchyma of various plants in different parts of the United States of America.

1004 ***Anagrus flaveolus* Waterhouse, a Parasite of *Peregrinus* (Delphax) *maidis*, the Corn Leaf-Hopper, in Trinidad.** — WATERHOUSE, CHARLES O. On a new species of Mymaridae from Trinidad. — *Bulletin of Entomological Research*, Vol. IV, Part I, p. 87, 1 fig. London, 1913.

This paper gives a detailed description of *Anagrus flaveolus*, which was bred from eggs of *Peregrinus* (*Delphax*) *maidis* in Trinidad.

The Editor of the *Bulletin of Entomological Research* notes that *A. flaveolus* is extremely closely allied to *A. frequens* Perkins, originally described from Hawaii, and *A. columbi* Perkins, from Columbus, Ohio, an intermediate between them. The three forms may be local races of a single species. *A. frequens* has a wide range and attacks four different genera of leaf-hoppers in Hawaii, including *Peregrinus maidis*.

1005 **The Red Clover Gall Gnat (*Amblyspatha ormerodi* Kieffer).** — DOUGALL, R. STEWART in *The Journal of the Board of Agriculture*, Vol. No. 3, pp. 225-230, figs. 1-6. London, 1913.

During the winter of 1912 and the succeeding spring, there was a great destruction of red clover (*Trifolium pratense*) in England. The clover which suffered most were Norfolk, Suffolk, Essex, Lincoln, Hunting, Cambridge, Surrey, Hereford and Shropshire. In practically all the same received, red maggots (belonging to a Cecidomyid) were found, either in the soil surrounding the plants, or, on dissection, in the spoiled plants. The writer bred out a number of adult flies from the diseased plants which he submitted to Professor Kieffer, who identified the new fly as belonging to the genus *Amblyspatha* and the species has been named *ormerodi* Kieffer; other animal and plant parasites were also found on the diseased clover, the most important being the fungus *Sclerotinia sclerotiorum* and the eelworm *Tylenchus devastatrix*, the latter fairly common.

From the large numbers of the Cecidomyid larvae, and the position of many of them, *A. ormerodi* can scarcely be regarded as other than a direct and distinct enemy of red clover. It is worthy of note, as a preventive measure, that it was observed that there was no disease on the part of the plants which had been fed off closely by sheep, while the plants in the other parts

are badly attacked. After the harvesting of the cereal crop, when the conditions are such as to lead to a strong growth of clover, and therefore to suitable plants on which the midges can lay their eggs, it would be better to have this clover cut, or eaten off by sheep.

Badly infested plants should be ploughed in deeply in order to prevent larvae and pupae reaching the surface again. Plants that look poor in winter may recover, for red clover is hardy, and can withstand considerable frost. This was proved by the writer who grew some of the diseased specimens of red clover sent to him for examination.

Turnip Moth Larvae Injuring Tobacco in Hungary. — GRÓF, BÉLA in *Magyar Dohánygyógyászat*, Year XXX, No. 11, pp. 3-4. Budapest, June 5, 1913.

Early in June, 1911, the writer found some diseased tobacco plants in the fields of the Tobacco-Growing Experiment Station at Debreczen; leaves showed yellow spots, whose shape and position suggested the presence of a fungus. These spots were at first round, but later became star-shaped; they occurred very regularly along the side veins of the lower leaves; increased in number and spread to about half an inch in diameter; some of the leaves they formed large yellow areas.

As a microscopical examination failed to reveal any fungus action, roots were examined; here larvae of the turnip moth (*Agrotis segetum* Schiff), were found, tunneling in the ground about two inches below the surface and destroying the roots one after another.

To get rid of the larvae, a search was made at two or three inches below the surface at the roots of all plants showing the first signs of the disease.

***Pseudococcus nicotianae* n. sp., a Scale Insect Injurious to Tobacco in Italy.** — LEONARDI, G. Cocciniglia dannosa al tabacco. — *Bollettino tecnico della coltivazione dei tabacchi pubblicato per cura del R. Istituto sperimentale in Scafati* (Salerno), Year 12, No. 2, pp. 75-80, figs. 1-4. Scafati, March-April 1913.

A systematic description of *Pseudococcus nicotianae* n. sp. made from specimens sent to the writer by the Director of the Royal Experimental Station for Tobacco Growing at Scafati (Salerno). This new scale insect does not appear to be of Italian origin, for its presence in Scafati coincides with its introduction from Germany of its host plant, *Nicotiana colossea* Andr. (1). Earlier, until the present time, the presence of the insect had not been recorded at Scafati, or elsewhere in Italy. *Pseudococcus nicotianae*, though confined to attacks on specimens of the variety of tobacco with which it was introduced, and to a kindred variety, *N. macrophylla colossea*, does a good deal of injury to these plants, whether they be wintering in greenhouses or growing in the open.

According to the *Index Kewensis*, *Nicotiana colossea* Ed. André is a synonym of *N. glauca* Ruiz and Pav. (Ed.).

Victoria and New South Wales into Southern Queensland, and in 1912 was very plentiful in several localities near Melbourne.

- 1012 - *Ceronema africana* sp. n. on *Caesalpinia pulcherrima*, n. *Dactylopius (Pseudococcus) virgatus* var. *madagascariensis*. *Ficus* sp. in Northern Nigeria. — MACFIE, J. W. SCOTT. On a new African species of Coccidae. - *Bulletin of Entomological Research*, Vol. IV, Part I, pp. 31-34, 4, 1-3. London, 1913.

The writer gives a detailed description, under the name of *Ceronema africana* sp. n. of a scale insect found on the "Pride of Barbados" (*Caesalpinia pulcherrima* Sw), a prickly shrub growing to a height of 5 to 10 ft which, on account of its showy red or yellow flowers, is a favourite in the gardens and compounds of Nigeria. This is apparently the first recorded occurrence of this genus in Africa.

The writer also mentions *Dactylopius (Pseudococcus) virgatus* var. *madagascariensis* Newst., as occurring plentifully on the young hoots of a tree called by the natives "chedia" (*Ficus* sp.). This insect has been recorded elsewhere as feeding upon cactus, coconut palm, cotton, violets, etc., and the species is also apparently new to the continental African fauna.

- 1013 - *Icerya purchasi* and *Novius cardinalis* in the Province of Beira Baixa (Portugal) (1). — MENDES, C. Aparecimento da *Icerya purchasi* e *Novius cardinalis* em S. Fiel. — *Broteria*, Vol. XI, Zoological Series, Part. II, p. 146. Salamanca, June 1913.

In 1910, at the beginning of the summer, a large number of *Icerya purchasi* were observed on the trunks and branches of *Acacia melanorhiza*, on the farm belonging to the Collegio of S. Fiel (Beira Baixa). The orange trees on the same farm and in the neighbourhood remained entirely immune; this scale insect, however, attacked the acacias in large numbers. Shortly afterwards in the same district, the presence of *Novius cardinalis* was recorded for the first time, and within a year all the *Iceryae* were destroyed by this natural enemy.

Researches as to the origin of the disease brought to light the fact that at Castello Branco, 12 miles from S. Fiel, *Icerya* had attacked some oranges which were thereupon thrown into the dust-bins. Shortly after this, the acacias were attacked by the scale insect.

- 1014 - The Red Spider on Cotton. — MC GREGOR, E. A. — U. S. Department of Agriculture, Bureau of Entomology, Circular No. 172, pp. 22 + figs. Washington, May 17, 1914.

A red spider (*Tetranychus bimaculatus* according to Harvey and Banks *T. telarius* according to Morgan and Berlese) appears to be becoming serious cotton pest in the United States. It is now prevalent throughout the cotton belt. Seasons of excessive drought are favourable to the development of the mite, and at such times the pest increases so rapidly that the damage often becomes severe before its presence is detected.

With the exception of an outbreak in Louisiana in 1893 no serious occurrence of red spider on cotton had been reported until 1903, at which time

(1) See also No. 891, B. July 1913.

complaints of damage came from S. Carolina and Georgia. In 1905 it caused serious injury in the above States, in N. Carolina and in Alabama. Since then its presence has been established from Maine to Florida and westward to California, as well as in the Hawaiian Islands. With the exception of western Colorado and portions of California no complaints of an alarmingly destructive nature regarding this pest have come to the writer's attention other than from the south-eastern portion of the cotton belt.

A detailed description of the insect in its various stages may be summarized as follows: The female lays 50 to 60 eggs on the under surface of the leaves. The eggs are perfectly round and colourless, and during the warmer months they hatch in about 4 days after being laid. Each of the larval periods (with six legs) and of the primary and secondary nymph (with eight legs) lasts in summer two days. Almost immediately on becoming adult the red spiders mate and begin egg laying. In South Carolina the time required for a single generation is 10 or 11 days throughout the summer months; in a year there may be about 17 generations.

The colonies of the parasite live on the under surface of the cotton leaves, and where the spiders are very abundant the web may become quite conspicuous. Feeding continues throughout the period of egg laying, causing the appearance of a wine-red spot on the upper surface of the leaf; as the leaves become badly infested they redden over the whole surface, become distorted and drop, often causing the death of the plant.

When cotton dies or becomes untenable in the late fall the red spiders seek more suitable food plants. Up to now they have been seen upon 190 species of plants. Throughout the active season they are common on beans, cowpeas, dahlia, ironweed, Jerusalem-oak weed, Jamestown weed, tobacco, tomato, wild blackberry, wild geranium, pokeweed and English violet. It appears, however, that the greatest number of red spiders that pass the winter do so on the two latter plants.

Heavy and long-continued rain works havoc to the red spiders and early late frosts destroy the young stages and probably some adults also. On the other hand the insect enemies of the mites succumb more easily to minimum temperatures than do the mites themselves, whence very cold winters are often followed by severe infestations.

Hot weather, although favouring red spider development, probably encourages even more the increase of insect enemies, of which several have been observed. The following are the most important observed at Chesburg, S. C., in 1912: *Arthrocnodax* sp. (Itonidae); *Triphleps insidiosus* (Anthracoridae); *Chrysopa quadripunctata* Burm.; *Euthrips fuscus* ds., and *E. occidentalis* Pergande; *Scolothrips sexmaculatus* Pergande; *Amella g-notata* Hbst.; *Hippodamia convergens* Guér.; (*Scymnus*) *Stethorus punctum* Lec.

As means of prevention and control the writer recommends:

1. *Clean culture.*—Namely the destruction of weeds and plants which harbor the pest. Pokeweed, Jerusalem-oak weed, Jamestown weed, wild blackberry and all border weeds and underbrush about fields should be pulled or grubbed out.

2. *Control on violet*. — Destruction or careful spraying of all *vi* growing in the neighbourhood of cotton fields.

3. *Selection of Variety*. — Avoiding those varieties of cotton w are more susceptible to red spider infestation, such as Dixie, "Wilt Proo Toole Peterkin, Bradwell, and Cook, and which suffer most in the on named, while Hite, Russell, Summerour "Half and Half" and Clevel showed the greatest immunity of all the varieties investigated.

4. *Broadcasting cotton*. — Thickly broadcasting cotton at the bound of a field as trap-crop for red spiders and ploughing it in.

5. *Removal of infested plants*. — If infestation has not advanced pulling up and destroying the first few infected plants may give a satisfactory results.

If on the contrary infestation has spread until a considerable pa is involved, it is sometimes advisable to plough up all the affected per order to save the rest. Ploughing a swath about 10 feet wide round infested spot and burning all the stalks in the swath and the enclosed is also useful.

6. — Spraying the under side of the leaves with one of the six mixtu given below, which proved to be the most satisfactory out of 26 combin tions which were thoroughly tested in 1911.

7. — Destruction of the winter quarters of the parasite.

Formulse and items	Total cost	Per acre
	\$	
Potassium sulphide, 3lbs. at 25 cents	0.75	100
Water 100 gallons		
Flowers of sulphur, 15lbs. at 4 cents	boiled { \$ 0.60 0.80	100
Fresh lime, 20lbs. at 4 cents		
Water 100 gallons		
Miscible oil, 5 gals. at \$ 1	5.00	100
Water to make 100 gals. (1 to 20.)		
Miscible oil, 2 1/2 gals. at \$ 1	\$ 2.50	99
Blackleaf tobacco extract, 40 % nicotine sulphate, 26 oz. at \$ 1.25 per lb.	2.00	
Water to make 100 gals.		
Flowers of sulphur, 28 lbs., at 4 cents	\$ 1.12	98
Soft soap, 14 oz., at 40 cents per lb.	35	
Water to make 100 gals.	1.47	

